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# REPORTS

FROM

# COMMISSIONERS:

*SIXTEEN VOLUMES.*

—*(1.)*—

ARMY (DISTINGUISHED SERVICES); MILITARY PRISONS;
PATRIOTIC FUND;
ARMY (BARRACKS AND HOSPITALS);
BARRACKS AND HOSPITALS (MEDITERRANEAN).

Session

5 *February* — 28 *July* 1863.

VOL. XIII.

1863.

# REPORTS FROM COMMISSIONERS:

## 1863.

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# REPORT

OF

REFORM CLUB
PALL MALL.

# THE ROYAL COMMISSION

APPOINTED TO INQUIRE INTO

# THE CLAIMS OF CERTAIN DISTINGUISHED-SERVICE COLONELS, QUEEN'S AIDES-DE-CAMP, AND CAPTAINS AND LIEUTENANT-COLONELS OF THE FOOT GUARDS;

TOGETHER WITH

# THE MINUTES OF EVIDENCE.

**Presented to both Houses of Parliament by Command of Her Majesty.**

LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1863.

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Sir, War Office, 9 May 1863.

I have the honor to transmit herewith Her Majesty's Warrant, appointing a Royal Commission to inquire into the claims of certain Officers referred to therein; and Her Majesty, having been graciously pleased to nominate you as the Chairman of the said Royal Commission, I am to request you will convene an early meeting of the Commissioners, for the dispatch of the business for which the Commission has been appointed.

I have the honor to be, Sir,

Your obedient Servant,

The Right Hon. Lieut.-Gen. J. Peel, M.P., De Grey & Ripon.
&c. &c. &c.

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# COMMISSION.

*VICTORIA* R.

**Victoria**, by the Grace of God of the United Kingdom of Great Britain and Ireland Queen, Defender of the Faith.

**To** Our right trusty and well-beloved Councillor, Jonathan Peel, Esquire, Lieutenant-General of our Forces, Our right trusty and well-beloved Councillor, Edward Pleydell Bouverie, Esquire, commonly called the Honourable Edward Pleydell Bouverie, Our trusty and well-beloved Sir Alexander Woodford, Knight Grand Cross of Our Most Honourable Order of the Bath and Knight Grand Cross of Our Most Distinguished Order of St. Michael and St. George, General of Our Forces, Our right trusty and well-beloved Councillor, Sir George Brown, Knight Grand Cross of Our Most Honourable Order of the Bath, General of Our Forces, Our right trusty and right well-beloved Cousin and Councillor, James Alexander Earl of Rosslyn, Lieutenant-General of Our Forces, Our trusty and well-beloved Sir William Brereton, Knight Commander of Our Most Honourable Order of the Bath, Major-General of Our Forces, Our trusty and well-beloved Henry Sandham, Esquire, Major-General of Our Forces, Our trusty and well-beloved David Russell, Esquire, Companion of Our Most Honourable Order of the Bath, Major-General of Our Forces, Our trusty and well-beloved Randal Rumley, Esquire, Major-General of Our Forces, Greeting.

**Whereas** We thought it expedient by Our Royal Presents, dated the 12th Day of April 1858, to authorize and appoint a Commission to inquire into the working of the System of Promotion recommended in the Report of a Royal Commission of 1854, and into the Question of Promotion and Retirement in the higher Ranks of the Army, commencing with the Rank of Major.

**And** whereas it has been represented to Us that 21 Officers who were promoted to the Rank of Colonel in the Years 1855 and 1856 as Our Aides-de-Camp and for distinguished Service in the Crimean War, consider that by the Operation of the Royal Warrant of 14th October 1858, founded on the Recommendation of the Royal Commission of 1858, they have been deprived, to an undue Extent, of the Position they attained by the Promotion conferred upon them.

**And** whereas it has also been represented to Us that certain Captains and Lieutenant-Colonels of the Guards, who were promoted to that Rank between the 20th June 1854 and the issuing of the Warrant of 6th October of that Year, consider that their Positions in the Army have been unduly injured by the Operation of the said Warrant of 6th October 1854, and also by the subsequent Warrant of 14th October 1858.

Now We, reposing great Trust and Confidence in your Zeal, Discretion, and Ability, have authorized and appointed, and do by these Presents authorize and appoint you, the said Jonathan Peel, the Honourable Edward Pleydell Bouverie, Sir Alexander Woodford, Sir George Brown, James Alexander Earl of Rosslyn, Sir William Brereton, Henry Sandham, David Russell, and Randal Rumley, to be Our Commissioners to inquire into the Claims of the said Officers.

And We do hereby authorize and empower you, Our said Commissioners, or any Three or more of you, to obtain Information thereupon, by the Examination of all Persons most competent by reason of their Knowledge, Habits, or Experience to afford it; and also by calling for all Documents, Papers, or Records which may appear to you, or any Three or more of you, calculated to assist your Researches and to promote the Formation of a sound Judgment on the Subject.

And We do hereby command and require you, or any Three or more of you, to report to Us, under your Hands and Seals, with all convenient Speed, your Opinion whether these Officers are entitled to any Redress, and if so, to recommend in what Form such Redress should be accorded to them.

And We will and command, and by these Presents ordain, that this Our Commission shall continue in full Force and Virtue, and that you Our said Commissioners, or any Three or more of you, may from Time to Time proceed in the Execution thereof, and of every Matter and Thing therein contained, although the same be not continued from Time to Time by Adjournment.

We further will and command that Our right trusty and well-beloved Councillor, Jonathan Peel, Esquire, Lieutenant-General of Our Forces, be appointed Chairman of this Our Commission.

And for your further Assistance in the due Execution of these Presents, We have made choice of Our trusty and well-beloved Thomas Cave-Browne-Cave, Esquire, to be Secretary to this Our Commission, whose Services and Assistance We require you to use from Time to Time as Occasion may require.

Given at Our Court at Osborne House, Isle of Wight, this Eighth Day of May One thousand eight hundred and sixty-three, in the Twenty-sixth Year of Our Reign.

By Her Majesty's Command,

DE GREY AND RIPON.

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This Commission was published in a supplement to the "London Gazette," on 9 May 1863, with the following notice:—

N.B.—It is requested that any officer whose interests may be affected by the above, and who wishes to be examined by, or to make any statement to the Commissioners, will forward his application to Mr. Cave, at the War Office, with the least possible delay.

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## LETTER TO SECRETARY OF STATE FOR WAR, FORWARDING REPORT, &c.

My Lord, War Office 15, June 1863.

With reference to your Lordship's letter of the 9th ultimo giving cover to the Queen's Commission of 8th May 1863, issued for the purpose of an inquiry into the claims of certain Colonels in the Army and Captains and Lieutenant-Colonels of the Foot Guards, I have the honour to transmit to your Lordship, for submission to Her Majesty, the Report of the Commissioners which has been duly signed by each member, with the exception of Sir George Brown, who is the only dissentient, and whose dissent, together with a Memorandum which he has annexed, I have also the honor to forward for Her Majesty's information.

763
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28 May

22 May

I have the honour to be, my Lord,

Your Lordship's obedient Servant,

The Right Hon. The Earl de Grey & Ripon,
Secretary of State for War.

J. PEEL,
*Chairman.*

# REPORT.

## TO THE QUEEN'S MOST EXCELLENT MAJESTY.

We, Your Majesty's Commissioners, having been appointed by Your Majesty's Commission, bearing date the 8th May 1863, to inquire into the claims of certain of Your Majesty's Aides-de-Camp, Colonels promoted for distinguished service, and Captains and Lieutenant-Colonels of the Foot Guards, as regards the operation of the Royal Warrants of 6th October 1854, and 14th October 1858, which were founded upon the recommendations of Royal Commissions, do humbly certify to Your Majesty that:

We have fully considered all the circumstances of the case, and have made a most searching inquiry into the claims of the officers referred to us, both by the examination of all witnesses, from whom it was hoped that information on the subject could be obtained, and by reference to various returns and documents furnished to us, and we find that;

Previously to the 20th June 1854 all officers who had attained the rank of Lieutenant-Colonel in the army were promoted to be Colonels by seniority, and an officer having reached the rank of Lieutenant-Colonel had an acknowledged right to expect that no promotion of any junior officer should be made over his head.

The only exceptions to this rule were as follows, viz.: Officers, being Lieutenant-Colonels, who were appointed Aides-de-Camp to the Sovereign, and were made Colonels without reference to the seniority of other Lieutenant-Colonels, and the case (which does not affect the present question) of certain grades in the Household Troops, Artillery, and Engineers, and Foot Guards, which carried with them the rank of Colonel.

In 1854 a Royal Warrant changed this rule and practice, and introduced two new methods of promotion to the rank of Colonel, without reference to seniority, viz.: by three years' service in the rank of Lieutenant-Colonel as described in that Warrant, and as a reward for distinguished service.

These two methods of obtaining promotion to the rank of Colonel were entirely new, and in contravention of the previous rule.

The Commissioners of 1854, on whose report the Warrant in question was framed, recommended that these changes should be accompanied by protection to the vested interests in the old system of promotion by seniority, to the advantage of which they thought the officers who were Lieutenant-Colonels at the time of the introduction of these changes, were justly entitled.

It will be observed, however, that this protection would not have embraced a security against the promotion of such of Your Majesty's Aides-de-Camp as were made Colonels over the heads of their seniors agreeably to an old-established rule.

Had the recommendation of the Commissioners been complied with, and had all officers who were Lieutenant-Colonels at the time of the introduction of the change been *then* made Colonels so as to preserve their seniority over those promoted under the new system, these officers would have been effectually secured against the injury which the change was calculated otherwise to inflict upon them.

The same object might have been effected by providing that no officer should be made a Colonel under either of the new rules without the concurrent promotion of all the Lieutenant-Colonels who were senior to him on the 20th June 1854.

The recommendation of the Commissioners was entirely overlooked in carrying into effect the changes they suggested, and hence a number of Lieutenant-Colonels who obtained their promotion to be Colonels subsequently to November 1854, either for three years' service, or for distinguished service, or as Your Majesty's Aides-de-Camp, passed over the heads of Lieutenant-Colonels senior to themselves.

The injustice apprehended by the Royal Commissioners of 1854 was felt to such an extent that another Royal Commission was appointed in 1858 to consider how it might be remedied.

This Commission considered the case of the officers thus affected, and also the case of those officers who had been promoted under the new rules in the interval between 1854 and 1858, amongst whom were comprised the 21 officers promoted to the rank of Colonel in the years 1855 and 1856 as Your Majesty's Aides-de-Camp, and for distinguished service in the Crimean War, whose position in the army has been referred to our consideration by Your Majesty.

The Commissioners of 1858 were of opinion that the protection which was recommended in 1854 to be given to the officers who were Lieutenant-colonels prior to 20th June 1854, against the consequences of the changes then introduced, should have been afforded *at that time* by making all such officers Colonels with Commissions bearing date the 28th November 1854, being the date of the introduction of the new system by the first promotions ander it.

The Commissioners made their Report and recommendation to Your Majesty accordingly.

A new Warrant was thereupon framed bearing date 14th October 1858, in strict conformity with their recommendation, and the officers who were Lieutenant-Colonels prior to 20th June 1854, now stand in the Army List having their Commissions as Colonels dated 28th November 1854, and in precedence of the Colonels who were junior to them as Lieutenant-Colonels, and who had obtained their Commissions under the new rules promulgated in the Warrant of 1854.

So great is the evil of creating doubt and uncertainty in the Army by altering the positions of officers attained through the provisions of Royal Warrants, that we now humbly submit to Your Majesty that no alteration should take place in the present relative position of the Colonels whose Commissions were antedated to 28th November 1854, under the Warrant of 1858, and of officers appointed Aides-de-Camp to Your Majesty, or Colonels for distinguished service between 6th October 1854 and 14th October 1858, and we are of opinion that the recommendations of the Royal Commission of 1858 should be adhered to.

In this decision we include the cases of certain Captains and Lieutenant-Colonels of the Foot Guards who were promoted to that rank between the 20th June 1854 and the issuing of the Warrant of the 6th October of that year, although we consider that the interests of these officers were more seriously affected by the change introduced by that Warrant than could have been anticipated at the period.

We humbly submit this our Report to Your Majesty's gracious consideration.

J. PEEL. (L.S.)
E. P. BOUVERIE. (L.S.)
ALEXR. WOODFORD. (L.S.)
ROSSLYN. (L.S.)
WM. BRERETON. (L.S.)
H. SANDHAM. (L.S.)
D. RUSSELL. (L.S.)
R. RUMLEY. (L.S.)

THOS. C. B. CAVE, Secretary,
War Office, Pall Mall, 15 June 1863.

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I dissent from the opinion come to by the majority of the Commission, and have declined to sign their report for the reasons assigned in my Memorandum of 22nd May, attached to the proceedings.

War Office, 28 May 1863.

G. BROWN,
*General.*

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## Memorandum by General Sir G. Brown.

It appears to me that the whole difficulty as regards the places of the Queen's aides-de-camp and of the officers who have been called the "Distinguished Service Colonels" on the list of the Colonels of the Army has arisen from a succession of administrative oversights and inadvertences, which it becomes the duty of this Commission to investigate, and to endeavour to correct, before it can expect to adjust the question submitted to its consideration in a satisfactory manner.

The Royal Commission of 1854 proposed that from and after the 20th June in that year the system of promotion by general brevets should be abolished, and that thenceforth, in order to attain to the rank of colonel, lieutenant-colonels should be required to serve *three* years in command of a regiment or battalion, or in some staff appointment necessarily held by an officer of the rank of lieutenant-colonel; but in introducing this change into what had hitherto been the practice of the Army, the Commisioners at the same time recommended that the claims and interests of the then existing lieutenant-colonels should be carefully protected from injury, and that they should not have their just expectations disappointed.

Now it is not reasonable to suppose that by this recommendation it was proposed that these lieutenant-colonels should be protected from the operation of the long established practice and prescriptive right of the Sovereign to select Her aides-de-camp, and to confer on them, when so selected, the rank of colonel, without reference to their position on the list, but rather that it should be taken in its natural and ordinary sense, and that the intention was that the officers in question should not be liable to be passed over by their juniors under the *three years rule*.

However this may be the recommendation of the Commission, as would seem, from some inadvertence, does not appear to have been carried out or embodied in the warrant grounded on its report; and accordingly all the lieutenant-colonels appointed prior to the 20th June 1854, who had not qualified as above stated, remained for some years subject to be (and actually were) passed over by many of their juniors who happened to have the advantage of being in command of regiments, &c. until a second Commission issued in 1858, as is understood, for the express purpose of rectifying these complaints and grievances.

This last Commission, without apparently adverting to the case of officers who, for distinguished service in the field, or for whatever other cause, might have been promoted in the interim, rather precipitately, and, as would seem without sufficient consideration, recommended that all the lieutenant-colonels appointed prior to the 20th June 1854 should be at once promoted to the rank of colonel, antedating their appointments to the common date of the 28th November of that year.

It may be here observed that there were two obvious modes of carrying out to the fullest extent the recommendation of the Commission of 1854, of keeping faith with and affording redress to the lieutenant-colonels who had been passed over, without doing the slightest injury or injustice to others; but on the contrary either of which would have been considered a great boon at the moment to all the parties concerned.

The first of these measures was to have declared that, whenever any lieutenant-colonel should become qualified for promotion to the rank of colonel under the new rule, all those standing senior to him on the list should be promoted at the same time; by which means the whole list of lieutenant-colonels would have been absorbed in the course of three years.

The second mode of proceeding was to have treated them all as if they had been actually employed, and to have announced that all the existing lieutenant-colonels alike should obtain the rank of colonel after completing three years in the subordinate rank, whether on half-pay or otherwise.

It is not reasonable to suppose that it could have been proposed at that time to adopt the sweeping and apparently gratuitous measure subsequently introduced, on the recommendation of the Commission of 1858, and which has given rise to the present difficulty, because its effect would have been to exhaust the whole list of lieutenant-colonels, and to leave the army without any officers of that rank, and also because some of these officers had only held the rank of lieutenant-colonel for a few months.

It seems to me, therefore, that what we have to do is to correct the error that the last-mentioned Commission appears inadvertently to have fallen into, and by a revisal of the dates of appointment of these officers, to effect such an adjustment of their relative positions in the list as may seem equitable and prove satisfactory to the rest of the army, if it should not exactly meet the views of both parties to the dispute.

On the principle, therefore, that those who from inadvertence, or from whatever other cause, may have come into possession of what they were not fairly entitled to claim, or have any just right to retain, may be required to make restitution, I would propose (adopting the second expedient as the most simple) that the colonels from Colonel Irwin down to Colonel White be treated as if they had all alike *duly qualified for promotion*, and take rank in the Army List as colonels from dates respectively *three* years subsequent to the dates of their lieutenant colonelcies, and that Her Majesty's aides-de-camp and the colonels promoted for distinguished service in the field be allowed to fall into their places in the list according to the dates of their respective appointments; for it must be observed that the same warrant, the modified operation of which has enabled the lieutenant-colonels prior to the 20th June 1854 to attain to a superior rank after an unusually short period of service, also authorizes the Crown to promote lieutenant-colonels for "distinguished service," so that they cannot be allowed to complain of one provision of it when they consider that another has been strained for their benefit and to meet their just complaint.

G. Brown.

U. S. Club, 22 May 1863.

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REFORM CLUB
PALL MALL

# MINUTES OF EVIDENCE

TAKEN BEFORE

# THE ROYAL COMMISSION

APPOINTED TO INQUIRE INTO THE

# CLAIMS OF CERTAIN DISTINGUISHED SERVICE COLONELS, QUEEN'S AIDES-DE-CAMP, AND CAPTAINS AND LIEUTENANT-COLONELS OF THE FOOT GUARDS.

**At the War Office, Pall Mall, Friday, 15th May 1863.**

PRESENT :

Lieut.-Gen. Right Hon. J. PEEL.
Right Hon. E. P. BOUVERIE.
Gen. Sir ALEXANDER WOODFORD, G.C.B., G.C.M.G.
Gen. Right Hon. Sir GEORGE BROWN, G.C.B., K.H.
Lieut.-Gen. Right Hon. the EARL OF ROSSLYN.
Maj.-Gen. Sir WILLIAM BRERETON, K.C.B., K.H.
Maj.-Gen. HENRY SANDHAM.
Maj.-Gen. DAVID RUSSELL, C.B.
Maj.-Gen. RANDAL RUMLEY.

LIEUT.-GEN. RIGHT HON. J. PEEL IN THE CHAIR.

Major-General the Hon. JAMES LINDSAY examined.

*Maj.-Gen. Hon. J. Lindsay.*

15 May 1863.

1. (*Chairman.*) Her Majesty having been graciously pleased to appoint this Royal Commission for the purpose of inquiring into the cases of certain aides-de-camp and other officers promoted for distinguished service in the field, we the Commissioners, believing that you, from your knowledge of the subject, and from the great attention you have paid to it, are best qualified to state the case of those officers, request you to do so?—In the first place, if you will allow me, I will lay before you a memorandum which contains a copy of two *Army Lists*. If you will look into the interior of that memorandum you will find that the extract from the *Army List* of October 1858, before the rectification took place, is on the left. It shows the position then held by the Queen's aides-de-camp and distinguished service colonels, each of whom is marked by an asterisk. It also shows the officers who had been passed over previously to those distinguished officers being promoted. The names of those officers who were so passed over are in italics. I will now pass from that to an extract from the *Army List* of April 1863. This list has the double purpose of showing those who were passed over and those who were promoted. Those in italics are those passed over by the action of the warrant of 1854, and they are put back into their places in this list. In this extract from the *Army List* of April 1863 the whole of those officers, except those promoted for distinguished service, now hold the dates of November 1854 by the rectification. The names of the 21 colonels in question are inserted; they are underlined in the places claimed, and denoted by asterisks in the places where they now stand.

2. (*Gen. Sir G. Brown.*) Why does this paper go so far back?—The purpose of that paper is to show clearly what the claims of these officers are. The object of these officers has been misconstrued and misunderstood. It has been generally thought that they were anxious to regain the places which they held previous to the warrant of 1858, whereas the argument of those officers is that it is perfectly just that every officer who had been passed over, whose name is in italics, above the names "Flude," "Tulloh," and "Teesdale," has a perfect right to be again placed over their heads. There has never been a dissentient voice upon that subject.

3. (*Maj.-Gen. Sir W. Brereton.*) Upon what principle do you draw that distinction?—I will show in due time the principle upon which that distinction is drawn. You will recollect that the Royal Commission in 1854 altered the system of promotion in the army to the rank of colonel. Periodical brevets were abolished, and the Commissioners recommended that all lieutenant-colonels on completing three years effective service in command or on the staff, should attain the rank of full colonel. But they also recommended that the existing interests of lieutenant-colonels, who got their rank of lieutenant-colonel prior to the 20th of June 1854, should be protected, and they used this language in the 52d clause on page 15 of the Commission of 1854:—"We have hitherto considered "the question before us only with reference to the "permanent system of promotion to be established. "We are, however, aware, that if this system were "at once substituted for that which has been hitherto "in force, without adopting some means to protect "the interests of those whose prospects would be "affected by the change, much injustice would be "inflicted on many officers who have relied on the "continuance of the present regulations. We are "of opinion that a liberal view ought to be taken of "the claims of these officers, and that in introducing "a change which the public good requires they "ought to be carefully protected from injury, and "from having their just expectations disappointed. "We would therefore humbly recommend to Your "Majesty that, before our suggestions are adopted, "should they meet with Your Majesty's approbation, "a general brevet should be granted; and also that "the regulation we have proposed, limiting the advancement of lieutenant-colonels to the rank of "colonel to those only who shall have served three "years in command of a regiment, or in staff situations as already described, should not apply to

*Maj.-Gen. Hon. J. Lindsay.*

15 May 1863.

" existing lieutenant-colonels or majors, including " captains and lieutenant-colonels of the guards." Then in the 53d paragraph it says, " With regard to " the manner and the numbers in which existing " field officers should, from time to time, or as vacan- " cies occur in the major-generals' list, be advanced " to the rank of colonel, we think this is a question " which may most conveniently be left for the con- " sideration of Your Majesty's servants; it is suf- " ficient that we should express an opinion that the " principle to be followed ought to be that of not " disappointing, so far as it is possible to avoid it, " the fair expectations of these officers, and of pro- " viding for their obtaining, without additional delay, " that promotion which they would have obtained " under the present system." The warrant which was founded upon this Royal Commission of 1854 contained the three years qualifying rule, but the warrant did not contain any protecting clause—such a protecting clause was entirely left out. In fact, the warrant was not worded according to the recommendation of the Commission, in the 52d clause, but from the summary in the second paragraph on page 27, which was to this effect:—" That existing field " officers be allowed to rise by brevet as under " the regulations now in force." That protection was left out, and consequently on the 28th of November 1854, every lieutenant-colonel who had completed his three years qualifying service in command of a regiment was at once promoted to the rank of full colonel, passing over the heads of other lieutenant-colonels senior to him who had not so qualified; a great many were very old soldiers, and field officers of very long standing, but the whole of their previous service went for nothing—they were superseded. I will illustrate what I am saying by the paper before you. There was an officer of the name of De Rottenberg, who was the junior officer promoted by the three years rule on the 28th of November 1854. He does not appear upon this list, because he is gone. He was promoted, passing over all those men whose names now stand in order in italics; of course upon that date there were a great many more. Upon the 1st of April 1855, Henry George Teesdale, of the artillery, was promoted by the three years rule to the rank of colonel, passing over those officers who are marked in italics. At this point I wish to draw the distinction which I alluded to just now. Major-General Brereton asked why the distinguished field officers did not claim to be above the officers in italics now above those whose names I have mentioned. But the answer is, that every one of those officers in italics had a right to have been promoted upon the 28th of November 1854, and had a right, as was proved afterwards by the Commission of 1858, not to have been passed over, or superseded at all. Therefore the principle is this, that every one of those officers in italics had a right to be above Colonel Teesdale, and consequently they had a right to be placed above every distinguished service officer promoted after Colonel Teesdale. You will recollect, also, that the Commission of 1858 was appointed for the purpose of rectifying the grievance that those very field officers suffered under. The Commission of 1858 went into the case of the superseded officers, and decided that their grievance was a substantial one, and that they ought never to have been passed over by the three-years qualifying officers, and that they ought all to be put back again into their places. With respect to the three-years men who passed over them, I will draw attention to the first page of the Report of 1858, in which a paragraph occurs which is of some importance, as showing what the Commissioners thought the object of their Commission to be. The third paragraph says:—" We have endeavoured, in accord- " ance with what we conceive to be the spirit of our " instructions, first to ascertain whether, in the " changes made on the recommendation of the Royal " Commission of 1854, the vested interests of the " officers already enjoying the ranks more immediately " affected by those changes were sufficiently guarded, " and if not, to report what measures are necessary " to neutralize the effects of any hardships so unintentionally inflicted upon them." Therefore the Commissioners of 1858 at once recognized that those superseded officers had a fair grievance, and accordingly they decided that they should be restored. The 47th paragraph says:—" It appears, therefore, to " us, after carefully weighing the amount of hardship " and inconvenience which will be undergone by " allowing the operation of the warrant on the lieu- " tenant-colonels of 1854 to remain undisturbed, or by " replacing the lieutenant-colonels passed over on the " list of colonels according to their original seniority, " there will be less hardship and inconvenience suf- " fered by adopting the latter than the former course." They agreed, therefore, by that paragraph, that the whole of those officers should be placed again above those three years qualified colonels who had passed over them, which would have neutralized the injury; and if the Commissioners had not gone further, the Queen's aides-de-camp and the distinguished service officers could have had no possible grievance. If the warrant of 1854 had carried out the recommendations of the Commissioners of 1854, the Queen's aides-de-camp or the distinguished service colonels would have been exactly in the place in which they now claim to be, and would have had no grievance whatever, because, as appears from what I read before, the Commissioners distinctly laid down the principle, that, although the three years' men were to be promoted, all lieutenant-colonels prior to June 1854 were to be protected from being passed over by those three years' men. We now come to what was done. What was done was this: the 48th clause says:—It appears, however, to us that it " would be less invidious to the promoted colonels," (not to the superseded officers, but to the promoted colonels,) " to whom every consideration is due, and " will mark more clearly the object and intention " of the proceeding, if the original error, commit- " ted in 1854, be now rectified by granting and " ante-dating an extension of the brevet given in " that year, so as to embrace all the lieutenant- " colonels who held that rank prior to June 1854." Now that is the grievance of the distinguished service colonels. The grievance that they complain of is, that a certain number of officers, who had no claim whatever by any rule, either by the old brevet system or by the new three years' rule, to be placed above them, were by that proceeding at once placed above them. And what they say is this, that no officer, who could not show a right to be a full colonel before they were promoted, has any claim to be placed before them. It is true that the warrant of 1858 had the contrary effect, but they appeal against that warrant, for reasons which I shall presently show. After Colonel Teesdale was promoted upon the 1st of April 1855, Sir Thomas Troubridge was selected by the Crown, and made a Queen's aide-de-camp, on the 18th of May 1855. On the 29th of June 1855, six other officers were made Queen's aides-de-camp, including Colonel Gordon, of the engineers, who appears separately on that list. Colonel Adams became a lieutenant-colonel on the 16th of July 1852, and he completed his three years' qualifying service on the 16th of July 1855, and was immediately promoted for that reason. I do not know whether it is worth while to follow the matter further, inasmuch as one name is as good as a dozen. The principle involved is this, that Sir Thomas Troubridge and six other officers were promoted in May and June 1855 to be Queen's aides-de-camp, and that Colonel Adams would not, even by the old brevet system, nor even by the three years' rule, have been a full colonel before the former were selected, unless he could prove that he had a right to be a full colonel, either by the old brevet system or by the new three years' rule, before those Queen's aides-de-camp were selected. You will see that Colonel Adams was only qualified by three years' service to be a full colonel, on the 16th of July 1855, after Sir Thomas

Troubridge and the six other officers had been selected by the Crown; that is the principle of the claim. I am aware that there is a distinction drawn between Queen's aides-de-camp and other officers. It is a very old standing privilege of the Crown, of almost immemorial date, to select aides-de-camp. The custom of the service formerly was not to select lieutenant-colonels, and make them colonels for distinguished service, without making them Queen's aides-de-camp.

4. (*Gen. Sir G. Brown.*) Do you know of any instance of the kind?—I do not know of any instance. I conclude that the right of the Crown was not disputed, but it certainly was not the usage. I do not come here to dispute (it will be for the Commissioners to consider that) either the Commission of 1854 or the warrant of 1854. We never say one word against that warrant, except that it did not carry out the protecting recommendation of 1854. On the contrary, I myself hold by the recommendation of that Commission and also by the warrant of 1854. By that Royal Commission, authority was given to the Crown to select for distinguished service. I do not dispute that it is right to carry out that clause if the Commission think fit to do so.

5. (*Chairman.*) Do I rightly understand you to say that the authority of the Crown to promote distinguished officers was given by the warrant of 1854?—A direct authority was given to the Crown to promote distinguished officers by the warrant of 1854, and I cannot point out undoubtedly any instance of the selection of a full colonel for distinguished service previous to that date.

6. (*Maj.-Gen. Russell.*) That authority was exercised to the prejudice of those who had been lieutenant-colonels at the time it was given, and thus interfered with vested rights?—Though I am here to give evidence in favour of all the 21 officers, there is a difference between the two classes. I may add that I think that if there had been the slightest idea that any dispute could have arisen with regard to the officers passed over and the officers promoted for distinguished service, it would have been very easy for the Commander-in-Chief and the Secretary of State for War to have advised the Crown not to promote those officers for distinguished service only, but to have made them all aides-de-camp.

7. The object was to reward a certain class of officers whom the Secretary of State and the Commander-in-Chief thought worthy of promotion?—Yes, exactly; and one set were made Queen's aides de-camp, and another set had the rank given to them without being so made. In either case the object was the same. If you look at the list below the distinguished service officers, you will find a certain number in italics, and you will also find a certain number in Roman characters. Those who are in Roman letters are officers who passed over those who are in italics. Of course the Queen's aides-de-camp and the distinguished service colonels claimed that none of those officers, either in italics or in Roman letters, had the slightest right to be placed over their heads, because they had no right whatever to be colonels before they themselves were selected. They say that all that ought to have been done was this—for instance, it was quite right to reinstate Colonel O'Connor and Colonel Darley George above Colonel Yorke, but it was not right that any one of the three should be placed above the Queen's aides-de-camp. I do not know that I have anything more to say with regard to the facts of the case; but there is one very material point which I wish to point out, and which I have not yet touched upon. The most serious case at the present moment among all these Queen's aides-de-camp and distinguished service colonels is that of Colonel Gordon of the Royal Engineers. He was serving as a lieutenant-colonel before Sebastopol on the 24th of April 1855; it pleased the Queen to promote him to the rank of full colonel on the 29th of June 1855 for distinguished merit. If he had not been deprived of his position in the list he would have been a general a year ago. He not only has lost one year, but he will, as may be fairly supposed, unless his claim is recognized, probably lose some four years more. You cannot calculate the deaths in the Royal Engineers at a higher rate than two in the course of a year and he has now got some seven or eight before him. Probably that is one of the most important cases of all. No doubt the officer promoted in his place is an older soldier by a good many years, but the position which Colonel Gordon takes up, and which I here take up for him, is that General Stehelin and Colonel Gordon were both serving as lieutenant-colonels in April 1855. The former would have been very happy indeed, I have no doubt, to have been in the trenches before Sebastopol, but he was not there, whereas Colonel Gordon was there. And the Crown, under the advice of the Commander-in-Chief and the Secretary of State for War, thought that his duties before Sebastopol were so meritoriously discharged that he was selected to be a full colonel on the 29th of June 1855, while to the misfortune of Colonel Stehelin he could not have been so selected. When Colonel Gordon was selected to be a full colonel Colonel Stehelin was only a lieutenant-colonel of the 19th of September 1853, and had no claim whatever to be a full colonel under any rule before the 19th of September 1856. There is no rule of the service that would give General Stehelin a right to be a full colonel before that date, namely the 19th of September 1856, and Colonel Gordon was selected by the Crown on the 29th of June 1855. What I say with regard to those two officers applies also to others. Colonel George has appealed. We must feel for an old soldier. Colonel George is an old soldier. I think he obtained the brevet rank of lieutenant-colonel in the 22nd regiment. But the fact remains that Sir Thomas Troubridge, whose name I use because he is the senior aide-de-camp, and Colonel George were both lieutenant-colonels in May 1855. Colonel George was not serving, and had not been in the Crimea. Sir Thomas Troubridge was selected by the Crown on the 18th of May 1855. Colonel George was not selected; he became a full colonel on the 27th of September 1856, namely, three years after he got his lieutenant-colonelcy. Consequently, I maintain that under no circumstances can Colonel George have the slightest claim to deprive a Queen's aide-de-camp, selected before he had a right to become a full colonel, of the position which that Queen's aide-de-camp holds. The same remark applies to Colonel O'Halloran, who has also appealed. But I will come to the case of another officer, whose name has been extensively used, that is, Sir Alfred Horsford; he is a very distinguished soldier. I use his name because he has been brought forward constantly. I think Colonel Brownrigg has brought his name forward. Sir Alfred Horsford's case is this: when a major, he was promoted for service in the Caffre war to the rank of lieutenant-colonel, but at Sebastopol he and Colonel Gordon were both serving as lieutenant-colonels. It pleased the Crown in June 1855 to say to Colonel Gordon, I make you my aide-de-camp, with the rank of colonel; but though I have no doubt that Sir Alfred Horsford's services before Sebastopol were very meritorious (I do not know whether he commanded the Rifles, but at any rate his services were meritorious, I have no doubt), he was not selected by the Crown; he might have deserved it, that I cannot say. It is in the power of the Commander-in-Chief to advise, and the Commander-in-Chief did not advise the selection of Sir Alfred Horsford. Colonel Gordon was made a full colonel, and Sir Alfred Horsford was not, he did not become a colonel for 2½ years after Colonel Gordon was made a full colonel by selection. Sir Alfred Horsford afterwards went out to India, where his services were very distinguished, and was already a full colonel before he was otherwise rewarded. But of course I maintain that the services of Sir Alfred Horsford, subsequent to his service in the Crimea, give him no claim to be a full colonel before Colonel Gordon, unless he can show (if he can show it), by some rule of the service or other, that he was ever entitled

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to be a full colonel on a date before Colonel Gordon was selected. I am afraid he cannot show that. The position in which those officers stand is undoubtedly this, that the warrant of 1858 gave them their position; but these distinguished officers, on the other hand, appeal against that warrant. And I also maintain that the Royal Commissioners of that date, namely 1858, either overlooked the case of these Queen's aides-de-camp and distinguished service colonels, or, if they did not overlook their case, I appeal on the part of the Queen's aides-de-camp against their decision. And I maintain, further, that though they were justified in making any recommendation they pleased, yet, unless either the Secretary of State understood it, or the Chairman of the Commission understood it, or the Crown was led to understand it, you had no right to deprive those officers of what the Crown has given them, unless the officers who deprive them of it could show that they had claims to be full colonels before any of those officers were selected by the Crown. That is the principle upon which I argue; but I will mention another officer, Colonel Brownrigg, whose case is a very hard one. He has appealed twice against any alteration being made; but we must deal with the case thus: the Crown selected Colonel Brownrigg for distinguished service in November 1855. The consequence of his not having been selected earlier was, that certain staff and other officers serving in the Crimea, who were junior lieutenant-colonels to him, were placed over his head by being promoted in May, June, and July, 1855. That, he says, is a great mortification to him; but I am sorry to say, sitting here as a witness, I cannot acknowledge the claim of Colonel Brownrigg, because he was rewarded for service in November, to be placed above officers selected for service in May.

8. (*Gen. Sir G. Brown.*) I suppose he was made a colonel when he was not qualified by length of service?—No; I use Colonel Brownrigg's own words, he says, because "I am in the position of being a guards-"man." Of course I would rather that Colonel Brownrigg's words were used than mine. Colonel Brownrigg of course will prove his own words, and Colonel Brownrigg states, and states in print, that he was recommended for promotion upon the distinguished service list in July 1855, and that he was refused promotion because he was a guardsman. I must mention names, because it is a part of my case. Colonel Brownrigg says, "The next officers promoted "were eight, who were made Queen's aides-de-camp "on the 29th of June 1855, and then on the 17th of "the following month six more were promoted 'for "'distinguished service.' Amongst these last I was "recommended for promotion by the Commander-in-"Chief of the army in the field; but I was arbitrarily "excluded from the list for no other reason alleged, "than 'that I was a guardsman;' my services for 10 "years in the line, five of them as adjutant in the "Mauritius and East Indies, being thus completely "ignored." I think it is fair for me, when appealing against Colonel Brownrigg, to state what he says, though it is not for me to pass an opinion here upon what the Crown chose to do. I am only concerned with what the Crown did when the Crown promoted him in November, and did not promote him in May or June, consequently I say that Colonel Brownrigg, who was promoted in November, could have no claim to go over Colonel Gordon, who was promoted in June. Then Colonel O'Halloran has made an appeal more upon service than upon anything else. Colonel O'Halloran is a very old soldier, and he says: "Some of these officers, being much "younger men than I, were placed over my head. I was "ready to serve in all parts of the world." He appeals against it. The argument, I think, is the same there, that length of service has nothing to do with the selection of a colonel for a Queen's aide-de-camp. If Colonel O'Halloran had seen double the service, and it had pleased the Queen to promote Colonel Gordon, or any other officer, for service in the field, Colonel O'Halloran not being so selected, I do not think that the length of service of Colonel O'Halloran has anything to do with the question. But, as a collateral part of the question, I may mention this, that, as far as the guards and the line are concerned, the actual state of the case is, that the average length of the service of the officers promoted for distinguished service in the field is absolutely longer than that of other officers concerned. But I do not think myself that that has anything to do with the case. We might compare the service of Colonel Norcott of the Rifle Brigade with that of Colonel Carey; the former has had nearly 40 years' service, and Colonel Carey 17 or 18. By the transposition of 1858 Colonel Carey is the senior colonel, having got his lieut.-colonelcy prior to June 1854, and Colonel Norcott is deprived of his position of having been selected before Colonel Carey became a full colonel. I think it desirable that you should know the effect of the claims of the Queen's aides-de-camp and distinguished service colonels. The effect of their claim is this: the greatest number of steps that any officer would suffer by the claims of the distinguished service officers being admitted, would be eleven in the progress towards the rank of general; it varies—from eleven to five. The greatest amount of suffering, therefore, that any officer would undergo by the admission of the claims of the distinguished service officers would be eleven, whereas there is far greater suffering in the case of the Queen's aides-de-camp. In the case, for instance, of Sir Thomas Troubridge, he at the present moment is a loser to the amount of 41 steps in the progress to the rank of general, Colonel Norcott 38, Colonel Lysons 36, Lord Longford 35, and others in various degrees,—that is the amount of suffering. At the same time the greatest suffering of all at this moment is that of Colonel Gordon, who has lost a year already, and is likely to lose four more. Colonel Chapman also, who was very distinguished in the trenches, would have been a general last month if he had not been deprived by the warrant of 1858 of the position which was given to him by the Crown. Therefore the principle laid down in this claim is this, that it was quite just and right, in the opinion of those officers, that every officer that Colonel Teesdale passed over upon the 1st of April 1855, appearing upon this list in italics, had a perfect right to be replaced above Colonel Teesdale, and consequently above Sir Thomas Troubridge and the rest. Against that they do not appeal, they think it just, and say nothing against it, but they claim that not one of those officers, who could not prove any right to be a full colonel under the old brevet system, or under the new three years' rule, before these officers were selected by the crown, has any right to be placed above them. I may say this, that, supposing the old brevet system had continued in force, and 185 officers being promoted to the rank of full colonel upon the 20th of June 1854, in the common custom there would have been no brevet again for three, or four, or five years, consequently if there had been a war Sir Thomas Troubridge and the rest would have been selected in May and June 1855, and have stood very considerably higher than the position which they now claim. They would have been above General Hill, and they would have been generals a year ago. If it had pleased the Crown, in consequence of there being a war, to have given, as they did in the old time, a brevet every year, and supposing upon the 1st of May 1855 there had been a war going on, and the Crown had given another brevet, and had promoted 200 lieutenant-colonels at once to the rank of colonel, Sir Thomas Troubridge and the rest would have stood exactly in the places which they now claim, even after that promotion. Therefore, under either system, the claims of these officers are alike supported—Sir Thomas Troubridge stands as the senior next to Colonel Teesdale.

9. (*Chairman.*) Previously to the year 1854 was not the promotion from the rank of lieutenant-colonel to that of colonel governed entirely by seniority, subject only to the appointment, by the Sovereign, of aides-de-camp carrying the rank of colonel?—Yes.

10. Had not every officer obtaining the rank of lieutenant-colonel, either by purchase or by the regular course of promotion, a right to expect that no other officer should be placed over his head except in the case I have mentioned?—Yes.

11. If in 1854 all the officers then lieutenant-colonels had been promoted at once to the rank of colonel, that would have preserved them in their relative positions with regard to one another, would it not?—Certainly.

12. Their promotion would have inflicted an injury upon no one at that period, would it?—Certainly not, at that period.

13. Although it would have been an unprecedented thing to make so large a brevet at once, there was no rule of the service which would have prevented its being carried out, because there was no fixed period of service for a lieutenant colonel before he became a colonel?—No.

14. But, as you have stated, that was not done in 1854?—It was not.

15. And you have stated that the interests of those officers were not protected by the warrant which, as you have pointed out, did not bear out the recommendations of the Royal Commission?—Yes, exactly.

16. Your ground is this, that, although those officers, if they had been promoted in 1854, would have inflicted no grievance upon anybody, yet, as they were not so promoted in 1854, have no right to claim more than a protection from the effects of the warrant upon them. I wish to elicit your views?—That is the case; these superseded officers merely claimed a protection against the three years' officers.

16*a*. And you state that it is perfectly admitted, even by those Queen's aides-de-camp and those very distinguished officers, that they have a very fair right to be protected against the operation of the warrant which would place officers of three years' service over their heads?—Yes.

17. Therefore it was necessary that when any officer had performed three years' service, all those senior to him should be made colonels?—Exactly.

18. And that, therefore, when any officer who was not a lieutenant-colonel in 1854 had, by three years' service, entitled himself to become a colonel, the whole, including the juniors, must have been promoted?—No; because the whole of the system turns upon the words "who were, prior to June 1854."

19. To put the question in another form, supposing an officer got a lieutenant-colonelcy immediately after the 20th of June, as soon as he had served three years he would be entitled to become a colonel, but he would go over the heads of those other officers unless you promoted them all?—The words "protection of "existing interests" only alluded to those who were lieutenant-colonels prior to the 20th of June 1854.

20. Did not it extend to the whole of them, even to the juniors of 1854?—Yes, the protection extended to the whole of the lieutenant-colonels prior to June 1854 against the three years' class.

21. Therefore, as soon as an officer who was not a lieutenant-colonel at that time, afterwards by service becomes entitled to the rank of colonel, in order to protect their interests the whole of the lieutenant-colonels of 1854 must be promoted to the rank of colonel, or else a junior officer would be placed over their heads; for instance, if on the 21st of June the major becomes a lieutenant-colonel?—Yes.

22. After serving three years, that man who was formerly a lieutenant-colonel is entitled to become a colonel; therefore, in order to protect the other officers against him, you must make them all colonels?—Yes, and that was done by all the lieutenant-colonels prior to June 1854 being replaced in former rotation above the three years' class.

23. You admit then that it would have been necessary the instant that one man acquired the right to a colonelcy under the new warrant, to protect the others by promoting them?—Yes; a man promoted to lieutenant-colonel on the 19th June 1854 would have a claim to protection, but anyone promoted to lieutenant-colonel on 21st June would have none.

24. I think one of the complaints, as stated by one of those distinguished officers who was examined before that committee—Colonel the Hon. Percy Herbert—(at page 13) was this, that "what they were "justly entitled to was protection from injury by this "new rule; they never complained (or if they did their "complaint was not on tenable grounds) that officers "had been promoted over them for distinguished "service, because that was an old practice before they "entered the service. Protection from injury by the "new rule was therefore what they were entitled "to"?—Yes.

25. That is the ground, I apprehend, which these distinguished officers take?—Certainly.

26. But you yourself say, that the authority to appoint officers as colonels for distinguished service, was given by the warrant of 1854?—The authority was given by the warrant of 1854.

27. Therefore any officer appointed under the warrant of 1854, as a colonel for distinguished service, and placed over the heads of those men who were lieutenant-colonels before that time, would be interfering with their vested interests, would he not?—That undoubtedly is a case which it is for the Commission to consider. Unquestionably it does interfere with those officers, but I may put the case thus, that the officers whose appeals are in the papers before you have made a complaint lately with regard to those distinguished officers, as different from the Queen's aides-de-camp, being placed above them, but it is a new ground which they have taken, and I believe it has been taken only by Colonel Brownrigg, to the best of my recollection.

28. I do not wish to allude to individual cases. I examine merely as to the principle. I think it is laid down in a letter from the Treasury "that long established "usage had recognized the privilege of promotion for "officers obtaining the appointment of Queen's aides-"de-camp in recognition of distinguished service in "the field"?—Yes.

29. In fact I believe there can be no doubt about it that it is in the power of the Crown to have an unlimited number of unpaid aides-de-camp, that appointment giving the rank of colonel, but that power was not exercised in this case. Would it not have been necessary, in order to protect the officers who were lieutenant-colonels previously to 1854, the instant the first officer was appointed a colonel for distinguished service to have made all the lieutenant-colonels of 1854 colonels?—I hold not, certainly, because the object of the Commission of 1854 in the protection of existing interests must be taken by the context; the context was the three years' rule, and the protection of existing interests was solely against that rule; it did not at all allude to the protection of existing interests against any other rule, but the context being the three years rule, the result is a protection against the three years rule, and not against any distinguished service rule.

30. Do not you think that it is of great importance that no prospective alteration should affect the rights and interests of those who have obtained that rank?—I cannot say that I do in a case of that sort. Supposing that the Queen had brought out a warrant quite independently of this new three years system, simply establishing a new rule giving you the authority to promote for distinguished service, I do not think that there would have been one feeling in the army from first to last against it. Such a thing had never been done, but a warrant of that sort might have been brought out, I think.

31. Do you not think it a great disadvantage that there should be an uncertainty as to the position of officers in their respective and relative positions arising from their being liable at sometime to be passed over by another officer? In fact, everybody must admit the great inconvenience which has arisen from the warrants of 1854 and 1858?—I agree entirely in the principle which you have laid down, but

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not as applied to this particular case: because, although the distinguished service may be a new rule, yet the same principle existed with reference to the Queen's aides-de-camp. The Crown says to one man, "I make you my aide-de-camp," and to another man, "I promote you for distinguished service."

32. It would not affect those who were aides-de-camp previously to the appointment of the first officers for distinguished service. Who were the first officers that were promoted? I believe Sir Thomas Troubridge was the first, and he was promoted in May 1855?—Yes.

33. Then there were a batch of officers promoted as Queen's aides-de-camp?—Yes.

34. According to your principle, supposing that the warrant of 1858 had not given their position at once to all the lieutenant-colonels, if the rule had been established that they were to wait till they had performed three years' service, those officers who were promoted then would have come into a position junior to the men who had been promoted for the three years' service, they would have come in where they claimed to be?—Yes.

35. Then the instant that the first man was promoted for distinguished service, in order to prevent his going over the heads of the others, it would have been necessary to promote those other officers to the rank of colonels; therefore, the date of their colonelcy would have been the date of the promotion next before the promotion of the officer for distinguished service?—I hold that if they had been selected for distinguished service it would have been different, because, in the case of an officer being selected for distinguished service, the others have no vested interests to be protected against him. I hold that the vested interests which were to be protected were simply and solely as against the three years' rule.

36. What would make the difference between the interests to be protected against the three years' service and against the distinguished service, except the opinion of the Commissioners?—The opinion of the Commissioners and the warrant of 1854.

37. The warrant of 1854 did not protect them against either?—No, the Warrant of 1854 gave them no protection, but it gave authority to promote for distinguished service.

38. Then it is merely upon the opinion of the Commissioners of 1854 that the distinction is raised between the promotion for distinguished service and for three years' service?—Certainly; it was by their opinion and their recommendation that the clause was inserted.

39. It does not appear that the recommendation was attended to in either case, but you state that such a recommendation is contained in the Report, that they should be protected against the one, but not that they should be protected against the other?—That is the case certainly. The protection in the Report is against the three years' rule.

40. (*Gen. Sir G. Brown.*) Am I not right in considering that, had all those lieutenant-colonels, prior to June 1854 been promoted at once when the warrant was issued in that year, there would have been no ground of complaint?—Certainly that is so.

41. If the measure that was subsequently carried out in 1858 had been carried out before, there would have been no ground of complaint?—No, because they would have been all breveted in 1854, and the effect of that would have been that the distinguished service officers would have been where they now are.

42. If, in carrying out the retrospective measure of 1858, they had given to all those lieutenant-colonels, without reference to the commanders, the rank of colonel when they had completed the three years, would there still have been any ground of complaint?—That is exactly what I think ought to have been done, and the effect of it would have been that Sir Thomas Troubridge and the distinguished service officers would have been exactly where they now claim to be.

43. Am I right in considering that all this difficulty has arisen from an administrative mistake and oversight?—That is my opinion.

44. If all those officers had been promoted at the end of their three years' service as lieutenant-colonels there would have been no complaint at all?—No, and the distinguished-service officers would be where they now claim.

44*a*. (*Maj.-Gen. Sir W. Brereton.*) On the part of those officers who had not commanded battalions for three years, but who by the rectification brevêt of 1858 were all made colonels, was there under the rules and conditions of the service when they entered it, or in the early part of 1854 before the warrant was made, any bar to their becoming full colonels, if circumstances had arisen to bring that about?—There was no bar; no, they would have risen by merit in their turn, and I cannot point to any instance of a lieutenant-colonel being selected for the rank of full colonel, except in the case of a Queen's aide-de-camp.

45. They were within the reach of the brevêt, if the old rule of brevêts had not been abrogated, is not that so?—Yes, but though the usage might have been against the selection, yet the prerogative of the Crown would have enabled it to be done.

46. It would have been possible to have given a brevêt to any extent?—Yes, no doubt.

47. Will those officers who claim to consider themselves injured, and whom you represent, be content to consider as final the decision of this Commission, whatever that decision may be?—I think you had better ask Sir Thomas Troubridge that question.

48. (*Chairman.*) You state, either in the letter addressed to the Secretary of State for War, or in your report, that you proposed three distinct methods of meeting the grievance of which these officers complain. Would each of those methods have had a similar effect in placing all the officers exactly in a similar position?—It would.

49. The means of rewarding or promoting distinguished officers is not confined to their relative positions in their rank as colonels?—No; in their rank as lieutenant-colonels.

50. Whatever their position may be in the list of colonels it is of course in the option of the Crown or of the Commander-in-Chief to select them?—I presume you mean as lieutenant-colonels.

51. As colonels or major-generals, are there opportunities afterwards of selecting them in preference to even those who are their seniors?—Certainly, it is the privilege of the Crown to select for whatever purpose it is thought right.

52. Therefore those means are still open to the Crown of remedying the grievance of which the distinguished officers have complained?—It is open to the Crown to appoint them. The three proposals which I made to Lord Herbert were, first, that each of the officers should be put back into the place he claimed, and ante-dated on the 28th of November 1854, that was thought the easiest way of getting over the difficulty; but there were some officers who on the 28th of November 1854 had not attained the rank of lieutenant-colonel.

53. And some of them were not majors?—Yes.

54. That rendered it necessary only to ante-date the rank of lieutenant-colonel one day before the rank of colonel?—Yes. Lord Herbert adopted that suggestion, and proposed it. The second proposal I made was to leave them in their present position, and select them out of their present position for the rank of general in the order which they now claim.

55. (*Maj.-Gen. Sandham.*) It was that they should be all major-generals?—They would all become major-generals exactly in the rotation in which they now claim to stand as colonels. The third proposal was then considered to be the best, it was, that they should remain in their present position in the list of colonels until such time as they would become generals in the places they claimed, and that they should then be promoted to be supernumerary generals so that the officer who would then have stood at the head of the list of

colonels, namely Colonel Adams, would not have been kept back by the promotion of the distinguished-service officers. You then would have absorbed in the general establishment the distinguished-service officers in the place in which they at present stand.

56. (*Gen. Sir G. Brown.*) That would have involved the expenditure of a considerable sum of money, would it not?—It would involve an expenditure of money. That was the proposal which Sir George Lewis adopted, and the Treasury declined it, saying that the second proposal which I have mentioned would meet the object.

57. But it also involved the complaint which the senior colonels made on the point of seniority; if one of those major-generals had been called into the service he would have been senior to them?—Yes.

58. Therefore, it would not have met their objection?—No.

59. Would your three proposals have placed all the officers in the same relative position, not only those promoted by distinguished service but the other officers also?—Most undoubtedly; my proposal, which ever way it might have been taken, would have had the effect of placing the distinguished-service colonels in the position which they now claim when they became generals. I claim for Sir Thomas Troubridge that he should be senior to Colonel Adams, whether as colonel or as a general—and so he would have been. One of the arguments which have been used against the claims of the distinguished service colonels has been based on the assumption that the Commission of 1858 did what the Commission of 1854 ought to have done. Now, in what the Commission of 1858 did, you will find no allusion to what the Commission of 1854 ought to have done. That argument against these claims means that the Commission of 1854 ought to have promoted all those officers in 1854; but the wording of the Commission of 1854 is extremely clear, it recommends the Queen to give a brevet by way of inaugurating and starting the new system.

*Maj.-Gen. Hon. J. Lindsay.*
15 May 1868.

60. (*Maj.-Gen. Rumley.*) I think there was not any limitation to the brevet recommended?—Yes, a general brevet was recommended, but it was not recommended that the whole of the existing lieutenant-colonels should be promoted; but the argument used is, "It is of course to be assumed that what was then "done (in 1858) should have been done in 1854."

61. When they recommended a brevet, there was limitation in 1854?—None; it was a very large brevet, one of the largest ever given, it took in the whole of the colonels of 1848.

The witness withdrew.

Colonel Sir THOMAS ST. V. H. C. TROUBRIDGE, Bart., C.B., A.D.C., half-pay 22 F., (*Deputy-Adjutant-General*), examined.

*Sir T. St. V. H. C. Troubridge, Bart.*

62. (*Chairman.*) Have you anything to add to the statement which has been made by Colonel Lindsay on behalf of the distinguished officers and aides-de-camp?—My own case would perhaps be more clearly put by supposing that the whole of the lieutenant-colonels in the army had been on parade when I was promoted, in which case, those who were then below me from Colonel Tyrwhitt down to Colonel Irwin, might fairly have said, we claim to be now on the colonels' list, in which case Sir Thomas Troubridge would be below us. I should have most willingly admitted their claim, because they had been passed over under the three years' rule, and might fairly have expected on that date to have been already colonels; but by the antedated brevet, not only those are placed above me, but more than 40 other colonels who, if they had been on parade in May 1855, could not have established any such claim.

63. You allude first of all to those whom you say would have been seniors to you, arising from the circumstance of their having served three years?—Yes, from having served three years on that date, whether on qualifying service or not, they might therefore fairly say, promote us on the day on which we complete three years' service, otherwise we are in danger of being passed over by some junior officer. I think Major-General Lindsay has not, perhaps, quite sufficiently dwelt on the point of our present position being the result of an oversight in the preparation of the warrant of 1854, because we should have been placed in exactly the positions we now claim had the warrant of 1854 had the protecting clause inserted in it which was recommended by the Commissioners of 1854 against the three years' service rule. The 8th clause of the warrant was taken apparently from the summary of the report of 1854, and not from the body of the report; the summary gave simply a recapitulation, and the detail was in paragraph 52 in the body of the report. That paragraph strongly insisted on protection to existing interests. Had that protection been given we should have been exactly in the places we now claim, because each officer would have been promoted on attaining the qualification of three years' service. Colonel Teesdale on the 1st April 1855 completed his three years' service, and I should have followed next, having been appointed aide-de-camp to the Queen in May 1855.

64. (*Mr. Bouverie.*) Have you any grounds for supposing that the Commissioners drew a distinction in the protection they recommended, between the protection against the three years' rule, and the protection against the distinguished service promotion, which they also recommended to be introduced?—I think for my own part that the two cases are in a precisely similar category, and that the protection was not thought of as regards the distinguished service colonels, and therefore no protection was given.

65. In neither case protection was given?—It was omitted in the warrant by an oversight.

66. (*Chairman.*) You think the cases were exactly similar?—Yes, and that when a distinguished-service officer was promoted, those over whom he went might fairly claim the same protection as from the three years' rule. Had this been foreseen it would have been provided for, but the special promotion given to the 10 colonels in question cannot in justice be cancelled three years afterwards on account of an official oversight. The cases of the supernumerary major-generals are similar, and on the same principle these colonels may say, if you have promoted in such a way as to injure the vested rights of other officers, then make us supernumerary major-generals when the places we claim come to the top of the list.

67. You admit that there is a distinction between the distinguished-service officers and the Queen's aides-de-camp?—Yes, a decided distinction, the one having been promoted under the new rule of 1854 and the other under a very old and well-established and well-known rule, to which no exception has been taken, at least as old as the reign of George the 1st; but you cannot in justice cancel the special promotion given in either case.

68. If that was carried into effect, and a distinction between the distinguished-service officers and aides-de-camp adopted, there would only be seven officers with whom to deal, would there?—There would be 11 officers.

69. Are the 11 officers senior to Colonel Borton?—Only five of them.

70. If, when Colonel Borton had been promoted, he had carried up all above him, there would have been only five?—Yes, if it had been foreseen at the time that the special promotions under the 13th clause of the warrant of 1854 would have affected

*Sir St. V. H. C. Troubridge, Bart.*

5 May 1863.

the interests of the lieutenant-colonels of dates prior to 20th June 1854, it is probable that Colonel Borton and the other 10 would have been promoted as Queen's aides-de-camp. I think those officers may fairly say, it is not just to put us back because we were promoted under an oversight. It can be shown that there was an oversight in the preparation of the warrant of 1854, in not carrying out the protection in the warrant which was recommended in the Commissioners' Report. Had that protection been given we should have been in a very different position. The oversight of 1858 also occurred because the error of 1854 was not clearly ascertained. I am anxious to show that the Commissioners of 1858 did not clearly see the nature of the oversight of 1854. In paragraph 34 they say they think it a matter of regret that the whole of the lieutenant-colonels prior to the 20th of June 1854 were not immediately promoted. Now the report of 1854 is dated on the 17th of June, and had it been proposed then to promote Colonel White, who was only a lieutenant-colonel on the 1st of June, it would have naturally been said, Why should you promote him now ? He is in no danger of being passed over until the 1st of June 1857, because no lieutenant-colonel junior to him can possibly be qualified for the rank of colonel for the next three years.

71. Might it not have been in order to prevent the possibility of his being passed over by an officer appointed for distinguished service ?—There is nothing in the report of 1854 to show that the Commissioners ever contemplated anything of the sort.

72. I think you stated that you yourself thought it was an oversight ?—The oversight was in the establishment of a new rule of promotion without providing for the protection of existing interests as was done in the case of the supernumerary generals. In 1854 was established a new rule of selection from the rank of colonel, and the existing colonels were partially protected, but the Commissioners of 1858 came to the conclusion that the seniors had not been sufficiently protected, and they established the present system of making every general promoted by selection supernumerary.

73. I suppose you admit that if in 1854 they had all been made colonels, although there might have been some inconvenience, neither you nor any other officer would have had the slightest ground of complaint ?—Not the slightest ; we should all have been placed on the colonels' list in its then state, and taken our place at the bottom where we were then put. I should then have been in the place where I am now, below Colonel White ; then another point that I am anxious to state is that there is nothing either in General Lindsay's oral evidence which has been alluded to, or in the report of 1858, to show that the case of the Queen's aides-de-camp was ever taken into consideration in any way. The words " Queen's " aides-de-camp " do not occur, either in the evidence or in the report. It appears to me that had the effect of the antedated brevet on the Queen's aides-de-camp and on the officers promoted for distinguished service been clearly foreseen, it is impossible to conceive that the Royal Commission would not have made some allusion to it. In General Lindsay's evidence allusion is made to the distinguished-service colonels. It is evident that the nature of the injury which would be done, unless their interests were protected in the revision of the list, was not clearly seen, and the president and three of the military members of that Commission have distinctly and repeatedly declared that they did not in any way take into consideration the injury that would be inflicted upon those officers by the antedated brevet. Therefore I think on those grounds that we have a fair claim to ask for a re-consideration, because there is not anything on the face of any of the proceedings to show that the injury which has been done to us was foreseen, and was the result of deliberate action on the part either of the Commissioners or the Crown. It has been stated that this case has been fully investigated and finally settled, but it does not appear that such is actually the case, as the proceedings of Sir Charles Yorke's Committee, so far from having been confirmed at any time, were followed by a recommendation, from the late Secretary of State, to the Treasury for the sum of 11,000*l.* to enable the officers in question to be promoted in their proper turns as supernumerary major-generals, which is certainly the very reverse of confirming the recommendation of Sir Charles Yorke's Committee.

74. Do you not consider that this question ought to be decided upon principle, without reference to any individuals ?—Yes, and I think our claims should be decided on a reference to what was due to us in 1855, without reference to any subsequent services. It will appear that the Commissioners sitting in 1858 did not sufficiently consider the state of the list in 1855 ; they recommended a wholesale antedated brevet, without sufficiently considering the interests that had sprung up in the interim under different rules, viz., the special promotions.

75. (*Maj.-Gen. Rumley.*) I think you stated that you considered that there had been an error, on the part of the Commission of 1854, in not recognizing the claims of those officers who might be promoted for distinguished conduct ?—I think, had they foreseen that a war might arise, and that officers of distinguished conduct might be promoted to the injury of the vested rights of the lieutenant-colonels then existing, they would equally have recommended that protection should be given, under the warrant, from those officers as they did from the three years' class.

76. To what class of officers do you consider that that protection referred ?—I think they had only under their consideration the operation of the three years' rule. Paragraphs 52 and 53 would tend to show that they said " We are now introducing a " new system of promotion, but let us protect the ex- " isting interests." They did not lay down exactly how they would give that protection.

77. (*Chairman.*) Would they not equally have said, with regard to the promotion of distinguished officers, that they ought to be guarded against that promotion also ?—In paragraph 52 the report speaks of the introduction of the new three years' clause ; had the retrospective effect of the new rule of promotion for distinguished service been foreseen, some allusion to it would probably have here been made, and it would probably have been recommended that the old system of promotion to colonel by appointment as Queen's aide-de-camp should be adhered to until June 1857, at which date, according to the spirit of their recommendation, Lieutenant-Colonel White the junior lieutenant-colonel in June 1854 would receive promotion.

78. Do you consider that the protection was intended for those officers who had not completed their three years' service in command, and not for others ?—It was for those who were on half-pay and otherwise not qualified. The Commissioners said those officers had their vested rights and must be protected. In paragraph 53 the Commissioners leave it rather an open question how it is to be done, but the principle is well established.

79. Do you not consider that they intended that protection should be given to all those who held the rank of lieutenant-colonel at that time ?—Yes, a full protection against the three years' rule.

80. (*Maj.-Gen. Rumley.*) It was not limited ?—No, it was not limited. I think they did not foresee what might arise as regards promotion under the 13th clause for distinguished service.

81. (*Maj.-Gen. Sir W. Brereton.*) Has it not been a constant practice in all warrants to give protection to any officers who were considered to have a claim under previous warrants ?—Yes, but in the warrant of October 1854 the protection was only omitted by

an oversight; had it been given as recommended no revision of the list would have been necessary in 1858, and we should have occupied the positions we now claim as aides-de-camp, and the 10 colonels promoted under the 13th clause would either have been promoted as aides-de-camp, or would be entitled to be treated in the same way as the seven supernumerary major-generals mentioned in Appendix 1 in the papers printed for the House of Commons.

*Sir T. St. V. H. C. Troubridge, Bart.*

15 May 1863.

The witness withdrew.

Colonel JOHN WILLIAM GORDON, C.B., A.D.C., R. Eng., examined.

*Col. J. W. Gordon.*

82. (*Chairman.*) You are one of the 21 officers whose cases are before us, are you not?—Yes. And I come before the Commissioners merely to state that I lay claim to the position of major-general of the 3d of April 1862, as set forth in the table submitted by Sir Thos. Troubridge showing the positions now held, and those claimed by the 21 officers in question. The grounds on which I make the claim have, I presume, been so fully stated, by Major-General Lindsay and Sir Thos. Troubridge, that it is not necessary for me to go into them. I have been frequently mentioned as having received great rewards for my services. I admit that the rewards were greater than what was due to my merits. I wish, however, to explain that my rapid promotion was owing to the invaliding of Colonels Vicars and Victor before the army proceeded to Russia, and the deaths of Brigadier-General Tylden and Colonel Alexander soon after the invasion of the Crimea. Hence I became commanding Royal engineer (under the directions of Sir John Burgoyne), for a considerable period, and in consequence I received, in addition to my share of rewards, other rewards also which would have fallen to the lot of one or other of the previous commanding engineers had they lived. To what is commonly called good fortune, therefore, I am indebted for my rapid promotion, and I believe it is not customary to take from an officer the rewards he has received in tha way.

The witness withdrew.

Major-General Sir EDWARD LUGARD, K.C.B., examined.

*Maj.-Gen. Sir E. Lugard.*

83. (*Chairman.*) Previously to 1854 the promotion from the rank of lieutenant-colonel to colonel was strictly by seniority, with the exception of the practice of officers being appointed aides-de-camp by the Sovereign, and with the exception of the different ranks in the Foot and Life Guards and Ordnance Corps which carried with them the rank of colonel?—Quite so.

84. Was it the practice to give the rank of colonel for distinguished service in the field?—No, certainly not.

85. Do you not consider that there is a distinction, then, between the cases of officers who were appointed colonels as aides-de-camp to Her Majesty and those officers who were appointed under the Warrant of 1854 for distinguished service in the field?—Yes, certainly; I have always considered so.

86. (*Mr. Bouverie.*) You have no doubt about the rule with respect to there being no such promotion for distinguished service before the warrant of 1854, have you?—I never heard of a single case of such a promotion to the rank of colonel.

87. (*Chairman.*) During the whole course of the Peninsular War, was there ever such a case?—No; the system was established by that warrant.

88. (*Gen. Sir George Brown.*) The Queen's aides-de-camp were made irrespectively of service in the field altogether?—Entirely.

The witness withdrew.

Adjourned.

## At the War Office, Pall Mall, Saturday, 16th May 1863.

PRESENT:

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| Lieut.-Gen. Right Hon. J. PEEL. | Lieut.-Gen. Right Hon. the EARL OF ROSSLYN. |
| Right Hon. E. P. BOUVERIE. | Major-Gen. GCB Sir WILLIAM BERETON, K.C.B., K.H. |
| Gen. GCB Sir ALEXANDER WOODFORD, G.C.B., G.C.M.G. | Major-Gen. DAVID RUSSELL, C.B. |
| Gen. Right Hon. Sir GEORGE BROWN, G.C.B., K.H. | Major-Gen. RANDAL RUMLEY. |

LIEUT.-GEN. RIGHT HON. J. PEEL IN THE CHAIR.

Colonel the Hon. PERCY E. HERBERT, C.B., A.D.C., Half-Pay 82 F. (*Deputy Quartermaster-General*), examined.

*Col. the Hon. P. E. Herbert.*

16 May 1863.

89. (*Chairman.*) Will you have the goodness to state to the Commission anything which you think bears upon the subject now under discussion?—In June 1855 I was selected as one of Her Majesty's aides-de-camp, and promoted to the rank of colonel, for services in the field. In 1858, after the sitting of the Royal Commission in that year, a warrant was issued by which there was a change made in the lists, and I found myself deprived entirely of the promotion which I received in the Crimea, and reverted to the same place in the *Army List* as I had occupied previously to the commencement of the Russian war. I beg to draw the attention of the Commission to the fact that promotion to the rank of colonel by selecting officers as aides-de-camp to the Sovereign is an old-established custom, and existed prior to the entry into the service of any officer concerned in the action of those warrants; and that the number of officers to be so selected by Her Majesty is not restricted by any limit. A new rule was laid down for promotion from the rank of lieutenant-colonel to that of colonel, in 1854, whereby lieutenant-colonels in command of battalions obtained the rank in three years, whereas brevet lieutenant-colonels, or those on half-pay, did not obtain it. This was complained of as a grievance, and I believe I am right in stating that the Commission of 1858 was assembled with a view of re-considering the new rules which had been laid down in 1854. In redressing the grievance which it was admitted had arisen, the warrant which was based upon recommendations of that Commission was framed in such a way as to deprive me of my promotion.

*Col. the Hon. P. E. Herbert.*

16 May 1863.

90. (*Gen. Sir G. Brown.*) You mean that it deprived you of your position on the list, do you not?—It deprived me of my promotion. As regards getting the rank of general, I was as far off as ever; in fact, it deprived me of the whole advantage of my position. I wish also to point out to the present Commission that justice might have been done to the officers who complained without so much injury to me. I believe I may state this, that the only grievance was that lieutenant-colonels, who had that rank prior to the existence of the new rule, found that they could be passed over by their juniors under that new rule. Inasmuch as no officer amongst them could be affected by the rule until he had completed three years' service, it appears to me that all that was requisite was, to put all existing lieutenant-colonels upon the same footing and to promote each as he completed his three years' service. I submit to the consideration of the Commission that that would have protected them absolutely and entirely from any injury under the warrant of 1854, and that as regarded the promotion which I enjoyed in being appointed Her Majesty's aide-de-camp, they had no grievance at all. I submit further, that the complaints that appear in the papers, which are laid before the Commission, and which have been laid before Parliament on the part of certain officers, stating that we have been placed over their heads, are directed against any promotion by selection for service in the field. One officer states that he has been so many years in the service, and was serving in the West Indies at the time. Another, that he was serving in the Crimea, but that he was not recommended by the Commander-in-chief, and not selected by the Queen for promotion. Those are not grievances that I imagine the Commission would be prepared to entertain as being just grievances against the promotion of an officer who is selected in the usual way for service. I will refer to an extract from the *Army List* of October 1858 and November 1858, before and after the warrant came out in that year. I take the number that I hold in the list from a certain fixed point, namely, Colonel Galloway. The paper (No. 1) which I produce is an extract from the *Army List* of 1858. The paper (No. 2) in the hands of the Commission is an extract from the *Army List* of 1863, and on referring to this I stand No. 60 on the list from Colonel Galloway, in the month of October. In the next month, the month of November, I stand 146th on the list from Colonel Galloway, that is to say, 86 places lower down than I was before. Therefore, I lost 86 places in the *Army List* from October to November 1858.

Appendix, page 51. Appendix, page 52.

91. (*Mr. Bouverie.*) In this memorandum (No. 2) the list is corrected to the present date?—Yes.

92. The other is the list as it stood at the time the change had been made, showing the numbers that had gone off in the interim, is not that the case?—Yes, showing those who had died, sold out, or retired on full pay. I do not know whether I have made myself quite clear to the Commission upon the proposal which I say would do justice to the officers who complained in 1858.

93. (*Chairman.*) Do you agree with the suggestion made by General Lindsay?—My suggestion is exactly the same as General Lindsay's. I would only refer to his statement in the printed papers.

94. (*Mr. Bouverie.*) You assume that all the officers who were put up in 1858 should stand in their places as if they had the claim of three years' service?—Yes.

95. (*Chairman.*) As soon as they had completed three years' service they should be promoted?—Yes. I say that gave them entire protection from the new rules, and that from all the old rules they could have no claim whatever in justice. It has been urged that the Royal Commission of 1854 meant to do what was done in 1858; but it is obvious that they shrank from making a whole batch of lieutenant-colonels (300 at a time) all full colonels, and that they gave a large brevet by way of clearing off the list, and leaving a small list to deal with exceptionally. We have reason to believe that the Commission of 1858 overlooked the bearings of the case as regards us, and in fact Lord Herbert, Sir James Scarlett, Sir Frederick Smith, and one or two other members of the Commision, have stated distinctly that they did not know how it affected us.

96. (*Mr. Bouverie.*) Were you before the Commission in any way?—I was unfortunately in India at the time, and therefore, though fully aware what was going on, I was not able to make myself heard.

97. (*Gen. Sir G. Brown.*) Under whose name do you conceive that you ought to stand at present in the general list. I do not refer to any of the Queen's aides-de-camp, or the distinguished service officers?—I will read the list in the form in which it would stand. After the name "Teesdale" would come the names "Troubridge, Griffith, Smith, Herbert."

98. (*Chairman.*) Your claim is identical with that of General Lindsay on the part of those officers, and is distinctly shown by the paper which is placed before the Commission?—Yes.

99. (*Gen. Sir G. Brown.*) Do you claim to be next below Colonel Teesdale?—With the exception of the other officers of the same class as myself. I was promoted in June 1855 to be colonel, and I claim to stand under the lieutenant-colonel who had completed three years' service as a lieutenant-colonel the day previous to my promotion.

100. You claim to be under Colonel Teesdale in the general list?—Yes.

101. (*Lieut.-Gen. the Earl of Rosslyn.*) You do not claim to be above Colonel Troubridge?—No, although he was a major when I was lieutenant-colonel. At the battle of Inkermann he was promoted to the rank of lieutenant-colonel—I remained in the rank of lieutenant-colonel which I held before the war began—he was promoted by Her Majesty on the parade at the Horse Guards in May 1855, therefore he has a perfect claim to be above me, I having been made a Queen's aide-de-camp in June 1855.

102. (*Gen. Sir G. Brown.*) Her Majesty chose to make him an aide-de-camp on that occasion, and you were promoted while in the Crimea, that is all the difference?—Yes, I was promoted later.

103. (*Maj.-Gen. Russell.*) You claim to be thirty-six higher than you are, according to this list, do you not?—No, about twenty places higher.

104. (*Chairman.*) You gave evidence, I think, before Sir Charles Yorke's Committee?—Yes, I did.

105. And in that evidence you stated, in reference to those who had been lieutenant-colonel previously to the year 1854, that what they were justly entitled to was protection from injury by this new rule?—Yes.

106. "They never complained (or if they did their "complaint was not on tenable grounds) that officers "had been promoted over them for distinguished ser- "vice, because that was an old practice before they "entered the service. Protection from injury from "the new rule was therefore what they were entitled "to." That was your evidence then?—Yes.

107. Do you remain of the same opinion still?—Certainly, unless as to the words "distinguished service," there may be a technical objection; with that exception I do, certainly.

108. It is your opinion that they ought to be protected from injury from the new rule?—Yes.

109. Previously to the year 1854 the promotion from the rank of lieutenant-colonel to that of colonel was strictly by seniority, with the exception of officers appointed aides-de-camp to the Sovereign, and of certain promotions in the household troops, &c.?—Yes, it was, to the best of my knowledge.

110. There was no instance, previously to the warrant of 1854, of any officer having been promoted from the rank of lieutenant-colonel to that of colonel for distinguished service in the field, except as Queen's aide-de-camp?—I believe not.

111. But although it had been customary to give brevet promotion in the junior branches of the service, for instance, from captain to major, and from major to lieutenant-colonel, as a reward for service, it has never been the custom to do so in the higher ranks, for instance from lieutenant-colonel to colonel ?—I cannot give an unqualified answer. I can only say that, when it was considered desirable to promote an officer to the rank of colonel from lieutenant-colonel, it was invariably done by making him an aide-de-camp to the Sovereign.

112. Therefore any system which introduced the custom of promoting from lieutenant colonels to colonels, without making them Queen's aides-de-camp, was a new regulation ?—Yes.

113. You stated that you considered that those officers ought to be protected from any injury arising out of the new warrant. I take it for granted, therefore, that you think they ought to be protected against any injury that would arise from that new rule ?—Certainly.

114. Then although the plan which you propose of making every one of those lieutenant-colonels a colonel after three years' service would clearly have protected them against any supercession on account of that portion of the new rule which related merely to service, it would not have protected them the moment it became a question entirely of promotion on account of distinguished service ?—I wish to explain on that point that I am here to urge the case of the Queen's aides-de-camp as being one of them, and of course the officers who were promoted in the other form will state their own case, but I think that, in fairness to them, I should say that what you have stated would be quite a technical objection, because inasmuch as Her Majesty was not limited in the number of aides-de camp she appointed, she might equally well have made them Queen's aides-de-camp as have promoted them otherwise.

115. Her Majesty might have done so, but she did not ?—Yes.

116. There is a real distinction between the case of Queen's aides-de-camp and distinguished service colonels then, is there not ?—Yes, certainly.

117. And if this promotion of distinguished-service officers had been taking place, the others would not have been protected by the rule with respect to the three years' service ?—Under the warrant, officers were promoted for distinguished service and the others might have had a grievance against them.

118. What is the date of your promotion as a Queen's aide-de-camp ?—June 1855.

119. Sir Thomas Troubridge was the first Queen's aide-de-camp promoted, I believe ?—Yes ; Sir Thomas Troubridge was promoted in May 1855.

120. Then there was a batch of five or six of whom you were one ?—Yes, six.

121. The next promotion was on account of distinguished service, but the officer so promoted was junior to you ?—Yes ; quite so.

122. Therefore what you state is this, that those officers who were lieutenant-colonels had a clear right to be protected against any injury from the new rule, but that they had no right to claim protection from the rules to which they were subject before the new rule came into operation ?—Just so.

123. Then, as far as your case is concerned, if any distinguished service officer was placed over their heads, by even the second part of the rule, you claim that they could not object to your promotion because they would have been perfectly liable to that before the warrant of 1854 ?—Just so.

124. You stated that the Royal Commission of 1854 shrank from including the whole of the officers in the brevet which they recommended ?—That is the inference that I have drawn myself.

125. Surely the Royal Commission of 1854 merely recommended a general brevet ?—Yes.

126. Do you think they could have gone further—they merely make a recommendation and the acting upon the recommendation is left to others ?—Yes. I mean simply that they shrank from making the recommendation.

127. We have no means of knowing what their recommendation was because it is general—is not that the case ?—I think they recommend an extended brevet in their report.

128. These are their words : "We should therefore "humbly recommend to Your Majesty that, before "our suggestions are adopted, should they meet with "Your Majesty's approbation, a general brevet should "be granted." I merely wish to point out to you that the Royal Commission would never take upon themselves to decide upon an extension of that brevet ?—Yes, the term "general brevet" was one commonly used. If the Royal Commission had intended to recommend the promotion of all existing lieutenant-colonels to the rank of colonel, they were quite at liberty to say so, and it appears improbable that they would have omitted doing so.

129. The Commissioners further say : "We have "hitherto considered the question before us only "with reference to the permanent system of promo-"tion to be established ; we are, however, aware "that if this system were at once substituted for "that which has been hitherto in force, without "adopting some means to protect the interests of "those whose prospects would be affected by the "change, much injustice would be inflicted on many "officers who have relied on the continuance of the "present regulations. We are of opinion that a "liberal view ought to be taken of the claims of "these officers, and that in introducing a change "which the public good requires, they ought to be "carefully protected from injury and from having "their just expectations disappointed. We would "therefore humbly recommend to Your Majesty that, "before our suggestions are adopted, should they "meet with Your Majesty's approbation, a general "brevet should be granted" ?—Yes, that was their recommendation.

130. I suppose you admit that if that recommendation of the Royal Commissioners of 1854 had been carried out at that time to the full extent, if the whole of those lieutenant-colonels had been appointed colonels, by a brevet including all of them, you would have had no cause of complaint ?—I cannot answer that question directly, because it makes an assumption which I do not admit. I can only say if they had so recommended, and if that recommendation had been carried out, and the brevet had included the whole of the lieutenant-colonels, of course there would have been nothing more to be said about it.

131. The Royal Commission which sat in 1858 to remedy what was admitted by everybody to have been a great grievance, inflicted by the warrant of 1854, did recommend that step to be adopted, and that is what you now complain of ; is not that the case ?—Yes, they did recommend it, not knowing how it would affect the class of officers who had been promoted for distinguished service in the interim.

132. (*Gen. Sir G. Brown.*) When you say "not knowing," you mean, I presume, not considering how it would affect them ?—Lord Herbert stated that he was not aware of it, and Sir Frederick Smith did the same.

133. If they had considered the subject they must have seen that, must they not ?—They considered the subject, but it is a most complicated thing ; they stated that they were not aware of it.

134. (*Maj.-Gen. Rumley.*) That is to say, some of the Commissioners stated so ?—Yes.

135. (*Chairman.*) I believe Major-General Lindsay was examined before the Royal Commission, was he not ?—He was, and stated his case. I think you will see, from the many questions directed to him, that, at any rate the chairman, Lord Herbert, did not understand it.

136. Then it is not correct to say the case was not brought before them ; you mean rather that they did not understand it ?—I did not say that it was not brought before them.

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137. We are not then to assume that the attention of the Commission was never drawn to the subject, but on the contrary that it was?—I did not say so. General Lindsay endeavoured to draw their attention to it, but I think you may judge from the report that their attention had not been sufficiently drawn to it for them to be aware of the effect of their recommendation. I do not think that the point is material. If it is proved that an injury, which might have been avoided, was inflicted upon Her Majesty's aides-de-camp, by the warrant based upon the report of the Royal Commission of 1858, that injury can be remedied by a new warrant in like manner as the injuries to other officers caused by the warrant of 1854 were remedied in 1858. The intentions of the Royal Commission of 1858 are not the main point to be considered, as it appears to me, but the propriety and justice of their recommendations.

The witness withdrew.

*Col. E. R. Wetherall.*

Colonel Edward R. Wetherall, C.B., A.D.C., Unatt. (*Deputy Quartermaster-General in Ireland*), examined.

138. (*Chairman.*) Is your position exactly the same as that of Colonel Percy Herbert?—As far as regards the action of the warrant upon the Queen's aides-de-camp it is precisely the same.

139. Are you one of those included in the same batch of promotions?—No, I am a Queen's aide-de-camp of the 11th of December 1855, which position I held until November 1858, a period of nearly three years. I then found that by the re-arrangement that took place I went down from number 89 in October 1858 to number 207 in November 1858, by which means I lost 118 steps.

140. I suppose you claim the same right as Colonel Herbert has claimed, and upon the same grounds?—Upon the same grounds.

141. Your ground being that the officers, who were lieutenant-colonels previously to the 20th of June 1854, had no right to be protected from that which they had always been subject to previously to that time?—Precisely, so far as the Queen's aides-de-camp are concerned.

142. Do you admit also, with Colonel Herbert, that they were entitled to protection from any injury arising out of the new rule?—I think they had a fair claim; I do not think they had any right. I conceive that the prerogative of the Crown is undisputed to alter the terms of service of the officers of the army.

143. I do not mean merely a right, but a right derived from the recommendation of the Royal Commission of 1854, which was not carried out by the warrant of 1854?—Yes, I think all lieutenant-colonels up to June 1854 have a fair claim to be put upon the most favoured footing. The whole of the lieutenant-colonels to that date ought to be put upon the same footing. For instance, take the case of an officer who was not employed because he could not get employment, and therefore could not serve his probationary period of three years. I think all lieutenant-colonels up to June 1854 should be promoted to be full colonels after three years' service in that rank, whether they had held a qualifying appointment or not.

144. That would not have protected them from being superseded by officers of distinguished service?—Certainly not.

145. Do you think they ought to have been so protected?—I do not think so.

146. That would have been the effect of it, would it not?—I do not admit their right to be protected from supercession by distinguished-service officers.

147. At all events, if the power actually existed, it was not the custom previously to 1854 to promote from the rank of lieutenant-colonel to the rank of colonel in that manner?—I think the custom existed actually, because every officer promoted as a Queen's aide-de-camp considered that his promotion was for distinguished service.

148. Then there would have been no necessity for any recommendation in the report of the Commissioners of 1854 to adopt the practice, if the Crown had that power?—The Crown had the power. I presume the only reason of the recommendation was that the number of Queen's aides-de-camp might have been inconveniently large.

149. As there were a certain number of Queen's aides-de-camp, although the number you state to be limited, the power would have existed?—The power would have existed.

150. Do you not consider that those officers who, by purchase or otherwise, had arrived at the rank of lieutenant-colonel before 1854, with the understanding that nobody could be placed over their heads, with the exception of the Queen's aides-de-camp, and those promotions in the household troops which carry the rank of colonel, had a right to expect to be protected?—I think they had not a greater right than the full colonels, because at that time no full colonel had been made a major-general over the heads of the other colonels; but at that time a recommendation was made to the Crown to make colonels major-generals over the heads of other colonels, and to promote major-generals to lieutenant-generals over the heads of the other major-generals, and lieutenant-generals to generals over the heads of the other lieutenant-generals, without complaint. If, therefore, the promotion of lieutenant-colonels to colonels for distinguished service is to be annulled, it follows that promotions from similar causes in other ranks should be so also.

151. Do you think that the rank of lieutenant-colonel had no greater claim to protection?—No greater than the rank of major-general, lieutenant-general, or any other.

152. Has there been any instance of giving a colonel brevet rank, and appointing him?—I am not aware of any case, except local rank.

153. (*Lieut. Gen. the Earl of Rosslyn.*) There have been cases of officers being made brigadier-generals?—Yes, "brigadier-general" has never been a recognized rank in the army, it is merely a temporary and local rank, but Sir Richard Airey and others were made major-generals and placed upon the establishment of general officers and no complaint was made. Sir Richard Airey, Sir James Yorke Scarlett, Sir George Buller, Sir R. J. Dacres, Sir Hugh Rose, Lord Cardigan, and others, were all made major-generals over the heads of the other colonels in the army.

154. (*Chairman.*) Your opinion is that these lieutenant-colonels had no right to protection?—No greater right than that of the colonels and major-generals of the army to similar protection.

155. Supposing that the Commissioners of 1854 and 1858 had taken a different view from yours of that question, and had decided that they ought to be protected against that which was a new rule, it would have been necessary, upon the first appointment to a colonelcy of one of those lieutenant-colonels for distinguished service, to promote the whole of the lieutenant-colonels to the rank of colonel, would it not?—If they had taken that view, decidedly.

156. The result would have been, would it not, that although it would not have been necessary to promote them immediately to the rank of colonel, and although they would have been fully protected by the rule laid down for three years' service against being superseded by the three years' service officers, yet it would have been necessary, if they were to be protected against being passed over by the distinguished service officers, to make them full colonels upon the occasion of the first of those officers being promoted?—Yes, it would have been necessary to do so. That could not have been the intention of the framers of the report of the Royal Commission, otherwise some such provision would have been placed in it.

157. I understood you and Colonel Herbert to admit that you thought they were fully entitled to protection from injury under the new rule?—In speaking of protection from the new rule, I only include so far as regards the officers who were promoted after having served their qualifying period of three years.

158. Why would they have been more entitled to protection from one portion of the warrant than from another?—Because the going up after three years' service was a mere matter of rotation; the other was a distinct promotion for distinguished service which every officer had not an opportunity of acquiring. And, as before stated, the right existed previous to the warrant of 1854 to supersede lieutenant-colonels by the promotion of officers to the rank of colonel on appointment as A.D.C. to the Sovereign.

159. There would have been many officers on half-pay who would not have had opportunities of performing the qualifying duties, would there not?—Therefore I say they had fair claims for consideration on that ground; they could perhaps have had no opportunity of serving the three years, and therefore there would be a claim for consideration, and that would be met by promoting all lieutenant-colonels after three years' standing in that rank, whether on service or not; this would have been a great boon to them.

160. It would have protected them against that portion of the warrant, but not against the promotion of distinguished service officers, would it?—Yes, before that warrant, I believe, lieutenant-colonels were nearly 10 years in that rank before they were promoted to the rank of colonel; but by that warrant they were allowed to be only three years before their promotion.

161. (*Gen. Sir G. Brown.*) The same warrant which conceded to the authorities the power of promoting officers for distinguished service, conceded to the lieutenant-colonels the right of promotion after three years' commanding of battalions, did it not?—Yes.

162. The same warrant did both, it conceded on the one side to the officers a limited period of service, and on the other side it conceded to the authorities the power of superseding them, and passing other officers over their heads for distinguished service?—Yes.

163. (*Chairman.*) Both of which were new regulations?—Yes. I wish to state that in my opinion lieutenant-colonels had no greater cause of complaint than the full colonels and major-generals, and no complaint was ever made by officers of these two latter ranks upon the subject. In each of those ranks officers were promoted over the heads of others.

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164. If a general brevet in 1854 had included the whole of those lieutenant-colonels, the only effect would have been to retain them in their relative positions to one another?—Yes.

165. It would have given no other advantage?—No.

166. It would only have retained them in the same position in which they were placed?—Precisely.

167. (*Mr. Bouverie.*) What is the advantage of being higher up in the list, as a colonel, rather than lower, is it merely the chance of promotion?—The certainty of promotion to become a major-general, and the ultimate consequence of that promotion, the getting a regiment early.

168. That is the sole advantage of precedence in rank?—Yes, that is the whole advantage of the military service. The only advantage which one man has over another is his superior rank.

169. (*Chairman.*) The opportunities of promotion from the rank of colonel, or of employment as major-general, or even of getting a regiment, are not limited to the relative positions in which the officers stand, are they?—They are not limited, because there is the chance of reward for distinguished service, but an officer's health may fail, and he may never have an opportunity of going on service again.

170. Having been promoted for distinguished service he has a claim, and it has been recognized that he has a claim, over others?—Yes.

171. One of the proposals, made by General Lindsay, in order to meet this case that has arisen was that the distinguished service officers should have their commissions antedated, and that they should become majors one day, and lieutenant-colonels the next day?—Yes.

172. There was no rule of the service which required any certain length of service between the ranks of lieutenant-colonel and colonel?—No.

173. Although that was required in certain junior ranks of the service, was it not?—Yes.

174. Your claim is clearly shown on the paper which was laid before the Commission by General Lindsay, is it not?—Yes. I claim to be next above Colonel Smith O'Connor, because he could not have been a full colonel before 1856 on the most favourable interpretation which can be put upon the Royal warrant.

175. (*Gen. Sir G. Brown.*) In the general list you would be next below Colonel Shuttleworth?—Yes, as the list now stands, but actually below Colonel McMurdo in the revised list, for he is an aide-de-camp to the Queen.

The witness withdrew.

Colonel Sir Alfred H. Horsford, K.C.B., Unatt. (*Deputy Adjutant-General*), examined.

*Col. Sir A. H. Horsford.*

176. (*Chairman.*) I believe you have expressed a desire to be examined before this Commission in order to state your objections to the proposed change?—I have sent in a short statement, but, as I thought you perhaps would wish it, I have come, in case I should be wanted, but, beyond what I have stated, I have scarcely anything to say. Of course I can have no reason to wish to have the state of things altered. I am perfectly satisfied with it as it is. Perhaps I had better read my statement. "In consequence of a clause in the London Gazette, dated "8th May, requiring officers to bring their claims "before the Commissioners appointed by Her Majesty "to consider the expediency of altering the present "position of colonels, I beg leave to forward a "summary of the services by which I attained the "rank which I hold in Her Majesty's army, and what "I deem to be their bearing on the present question. "I trust, however, that this statement will be accepted as merely detailing personal claims, and intending no disparagement whatever to the services "of others. The Kaffir war, of 1846 and 1847, found "me a captain in the rifle brigade; I was entrusted "with a wing of my battalion, which I took from the "Mediterranean to the seat of war, and which remained under my separate command for several "months previous to joining head-quarters. In that "war the services of the regiment were considered so "satisfactory, that upon hostilities being renewed in "1852, it was again selected by the late Duke of "Wellington to take part in that campaign. I then "had the honour, as a major, of commanding the "1st battalion, and, in consequence of being mentioned in orders, was promoted to the rank of "lieutenant-colonel."

177. (*Mr. Bouverie.*) At what date was that?—I was promoted in May 1853.

178. (*Chairman.*) You got brevet rank for services in the field?—I got brevet rank for services in the field. "In the Crimean campaign of 1854, owing to "the death of the senior major and to the lieutenant-colonel being in command of a brigade, I commanded "the regiment from its landing to the end of the year, "when I was invalided. This included the battles of "Alma, where we were, however, acting as reserve, "Balaklava, and Inkermann, and, for these services, "by the general promotion which took place in consequence, I received the honour of the Companionship

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" of the Bath and the substantive rank of lieutenant-colonel. Having, in the year 1855, formed the 3d battalion rifle brigade, I took it in 1857 to India, where, from February 1858 until the end of the mutiny, I commanded a brigade. For this Her Majesty raised me to the rank of Knight Commander of the Bath, and I was also deemed deserving of a good-service pension. With regard to these services bearing on the question now before the Commission, I have respectfully to submit that, having been thought worthy of promotion at a period anterior to the promotion of the officers whose position is now under discussion, I cannot but consider it would be hard upon me to be passed over by younger soldiers, unless their services shall be considered to have been superior to mine. Though admitting that the officers, now designated as the 'Distinguished Service Colonels', have stood at one time, in consequence of their promotion by Her Majesty, higher in the *Army List* than myself, still that same undoubted prerogative thought it proper to restore me, and other older soldiers, to our previous seniority. It should also be borne in mind that the generality of these officers, though at present dissatisfied with their position, are still very great gainers; and though justice has been done to others, nothing has been taken from *them*. In thus advocating what I consider my own claims, I beg to point out that I deem myself the more bound to do so, inasmuch as the interests of older soldiers than myself would be deteriorated by any alteration in the seniority now in question."

179. (*Chairman.*) You were appointed a brevet lieutenant-colonel, from the rank of major, in consequence of distinguished service in the field, were you not?—Yes.

180. But you would not have been eligible for a further step of brevet rank unless you were made a Queen's aide-de-camp until this warrant of 1854 came into operation?—No.

181. What you complain of is being superseded by officers for distinguished service in the field, as you might have received the same if such a custom had existed previously to the warrant of 1854?—Yes.

182. Therefore you complained of having been injuriously affected by one of the new regulations introduced by the warrant of 1854?—I did.

183. And you claimed that the protection, which the Commissioners of 1854 laid down in their report, ought to be extended to those who held the rank of lieutenant-colonel at that time, but which was not carried out in the warrant of 1854, framed upon that report?—Yes; I may say also, because it is supposed that when the Commission were inquiring into the subject they had forgotten and passed over the claims of the distinguished service officers, I have reason to believe that if the whole of them were asked the question they would not say that.

184. You were not present at that time?—No, I was in India.

185. Was His Royal Highness the Commander-in-Chief a member of that Commission?—Yes; and General Eyre and several others. I think they would not say that.

186. (*Gen. Sir G. Brown.*) You were not recommended for promotion on account of distinguished service in the Crimea?—I was not.

187. Colonel Norcott, I believe, was recommended?—Yes he was made a Queen's aide-de-camp.

188. That was for services in the field?—Yes.

189. (*Mr. Bouverie.*) As I understand it, these distinguished service colonels were over your head between 1854 and 1858?—Yes, up to 1858.

190. Then, in consequence of the change upon the recommendation of the Commission, you were put back into what you conceive to be your proper position?—Yes, as having been promoted for services in 1853.

191. (*Gen. Sir G. Brown.*) All these officers who are underlined here—the Queen's aides-de-camp and the distinguished service colonels—stood above you in the list up to 1858, did they not?—They did.

192. (*Mr. Bouverie.*) Were you a complainant in any way before that Commission?—No, I was not; I was in India. Now having, as we thought, received our rights, I was anxious that the state of things should not be altered, but should remain as it is.

193. (*Gen. Sir G. Brown.*) Did not Colonel Norcott command the 1st battation of the rifles during the greater part of the siege?—He was a major in the 2nd battalion in the early part, I was a brevet lieutenant-colonel in the first battalion.

194. You were not senior to him, were you?—He was senior to me in the regiment, but I commanded the 1st battalion till the end of 1854.

195. (*Gen. Sir A. Woodford.*) What was the date of your appointment as lieutenant-colonel?—May 1853.

196. (*Mr. Bouverie.*) You became a full colonel in 1856?—I should have been one on the 28th of May 1856 had it not been for certain deductions, which caused the rank to be postponed till September 1857.

197. You would have become so under the new rule?—Yes, after three years in command of a regiment.

198. That is, in 1856?—In 1857, by calculating the deductions referred to.

199. In the meantime, if an officer had become a colonel, as a Queen's aide-de-camp, for service in the field, then there would have been, according to the practice in the army, no just ground for a feeling of supercession on your part, would there?—The only question is, whether it was intended that officers should rise two steps at once—whether majors were intended to be made at once full colonels by brevet in a few days. It is not for me to say whether Her Majesty intended to give two steps to an officer instead of one.

200. (*Chairman.*) You were always liable, while serving as lieutenant-colonel, to be superseded by any person whom Her Majesty might choose to select?—Yes, but at the time I was a lieutenant-colonel some of those officers were only captains.

201. (*Mr. Bouverie.*) Was it ever the practice in the army to make a captain a Queen's aide-de-camp?—No, he must be a lieutenant-colonel; but some of those officers were made majors, and then lieutenant-colonels, and then full colonels, almost all in the same Gazette.

202. In one breath, as it were?—Yes.

203. (*Lieut.-Gen. the Earl of Rosslyn.*) You mean to say within a month?—Within little more.

204. (*Mr. Bouverie.*) That might have been done under the old system, might it not?—An officer might have been raised from a captain to a full colonel, if Her Majesty had pleased, by making him Queen's aide-de-camp, but he would have had to go through the rotation of the other ranks.

205. (*Chairman.*) Is there any rule with regard to a certain length of service in one rank being required, as is the case in some other ranks, before an officer can be made a Queen's aide-de-camp?—No, I do not think there is any rule laid down for an aide-de-campship.

206. Then a man might go from the junior rank of ensign?—So he might.

207. (*Gen. Sir A. Woodford.*) But that is not the custom of the service?—No.

208. (*Chairman.*) It requires a certain number of years' service in almost every grade of the service, until you come to the rank of lieutenant-colonel, and then there is no fixed period which it is necessary to serve before a man becomes eligible to be made a colonel?—No, not according to that rule.

209. (*Maj.-Gen. D. Russell.*) A captain must serve six years before he can be made a major, must he not?—Yes.

210. (*Gen. Sir G. Brown.*) The effect of the retrospective measure in 1858 was to place you over the heads of all those officers who had been made colonels some three or four years before you, was it not?—Yes, it was so; but then it must be also borne in mind that those officers, though perhaps not gaining quite so

much as they expected at that time, had still risen and gained a great many steps.

211. (*Chairman.*) The warrant of 1858 placed you exactly in the same position that you would have been in, if the warrant of 1854 had made all the lieutenant-colonels full colonels at that time?—Exactly so; what one feels, of course, is the disappointment that, because one war is not of so much importance as another, what one did in a former war is passed over by the new one, that, in fact, one's services in 1852 and 1853 are not considered of the same importance as those that took place in 1854 and 1855.

212. Do not you consider it injurious to the service that there should be great uncertainty as to the position held by the officers, and that it should be constantly subject to change?—There is a great deal of conversation in military circles upon that very same subject. Officers feel a degree of uncertainty as to their position in the *Army List;* no man knows where he will stand. I hear men daily saying, if I am passed over one day, to-morrow I may find myself at the bottom of the list of colonels.

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213. Therefore, are you not of opinion that, in making any improvements which may be thought necessary, all existing interests ought to be protected?—I am. I have always thought so, but that is a thing that must cut both ways, with them as well as with me.

214. (*Maj.-Gen. Russell.*) From your official position, and the means which it gives you of knowing the general feeling of army officers, are you of opinion that further change would shake all confidence in the permanence of the existing system, and in the security of the position of the officers themselves?—My belief, from the general tenor of the conversations I have heard, is that it would, on the whole, create an uncertainty as to the position which officers hold in the army.

The witness withdrew.

Colonel F. Darley George, C.B., Unatt., examined.

*Col. F. D. George.*

215. (*Chairman.*) I believe you wish to state your case to the Commission with respect to the claims of the distinguished service officers, and the Queen's aides-de-camp?—I come here respectfully to enter my protest against any supercession on the grounds of the application on behalf of these officers, whether promoted as Queen's aides-de-camp, or for so called distinguished service in the field. I conceive that the whole of the class of the old lieutenant-colonels prior to the 20th of June 1854, as was distinctly affirmed by the Royal Commission of 1854, in their report, had equally a vested right (with those included in the Gazette of the 20th of June 1854) in their Commissions, and that our interests should be carefully protected from injury, and that our just expectations should not be disappointed by any new warrant that should be issued. We were *de jure* colonels on the 28th November 1854, equally with those who are included in the last general brevet that took place prior to the abolition of all general brevets. We became *de facto* colonels, by the recommendation of the Commission of 1858 that we should be *de facto* colonels of the date of 28th of November 1854. In fact, it was considered merely an extension of the general brevet of 28th November 1854 to all lieutenant-colonels actually gazetted as such prior to that date, and effectually protected them from injury by supercession of their juniors, who were promoted in an unprecedented manner, under the provisions of the warrant of 1854.

216. That part of the Report of the Royal Commission of 1854 to which you allude is, I suppose, paragraph 52?—Yes, "we have hitherto considered the "question before us only with reference to the per- "manent system of promotion to be established. We "are, however, aware, that if this system were at "once substituted for that which has been hitherto "in force, without adopting some means to protect the "interests of those whose prospects would be affected "by the change, much injustice would be inflicted on "many officers who have relied on the continuance "of the present regulations."

217. That is the portion of the report of the Royal Commission to which you alluded in the statement you have made?—I did, I most emphatically rely on it. I was abroad at the time when this inquiry of 1858 came on, serving on the staff in the West Indies. I was relieved at the time of my return home under the provision of that new warrant; when I accepted that staff appointment I could have held it until I was a major-general, otherwise I would never have given up my full pay majority in the 22nd regiment. I served, I hope, with some credit to myself in that regiment for many years. The first step I ever got without purchase was brevet-major and C.B. (4th July 1843) for my services in the Scinde campaign, that is 12 years prior to the promotion of these distinguished colonels and Queen's aides-de-camp in 1855–56. I was also recommended in the strongest manner by Sir Charles Napier for promotion, and was offered and accepted the staff appointment of deputy adjutant-general in the Windward and Leeward Islands, with the brevet of lieutenant-colonel, 4th February 1853, and was placed on half-pay as major 22d regiment without receiving the difference, and my vacancy went without purchase in the corps. Thus I accepted staff employ under the old regulations, and have been deprived of it by the retrospective action of the new warrants of 1854, 1858.

218. Having obtained the rank of lieutenant-colonel proviously to June 1854, you considered, did you not, that, according to the rules of the service, you could not be passed over by any officers unless they were appointed Queen's aides-de-camp?—Not according to the old regulations then in force.

219. Previously to the 20th of June 1854, or any Royal Commission sitting at all, that was the understanding upon which every lieutenant-colonel, who had obtained that rank, acted, namely, that from that rank upwards it was purely seniority of promotion, with the exception always of the undoubted prerogative of the Sovereign to appoint an aide-de-camp?—Yes, I would be the last to question Her Majesty's prerogative to the fullest extent that Her Majesty, through her advisers, should think proper, but all Sovereigns alike must be just before they are generous. We were promoted to the rank of lieutenant-colonel prior to 20th of June 1854, and protection was not then given to us as clearly promised. The Royal Commissioners of 1858 distinctly affirmed that, and you know who they were, men of the same experience as those whom I have the honour to address now, and equally competent to decide upon it. Those Commissioners saw the injury which would be inflicted upon the old class of lieutenant-colonels of the army if the new system was at once introduced. I do not only refer to the distinguished service colonels, a new rank altogether. I say nothing upon that, because that part of the case has been almost abandoned, but I say that Her Majesty's prerogative has been exercised to a degree before unknown in the creation of aides-de-camp with rank of colonel.

220. Previously to the 20th June 1854, was not it the fact that there was no instance of an officer being promoted to the rank of colonel for distinguished service, except by being made a Queen's aide-de-camp?—I never heard of any.

221. Therefore that was a new promotion under the new warrant of 1854, and that you complain of as a grievance?—I do not complain of these warrants. I fully concur in their general provisions, but I again protest at being subjected retrospectively to them, and being superseded either on the list of colonels of 28th November 1854, as they now stand, or on the established

*Col. F. D. George.*
16 May 1863.

list of major-generals on unattached pay hereafter, by junior lieutenant-colonels, promoted on or subsequently to 20th June 1854 under those warrants, either by three or five years' service, as lieutenant-colonels, or for distinguished service, or even as Queen's aides-de-camp; for the Queen's prerogative is as unquestionably exercised in carefully guarding say 60 old lieutenant-colonels gazetted as such prior to 20th June 1854, as in promoting some 20 subsequently in a manner heretofore unknown in the British army.

222. You make a distinction between the warrant and the report of the Royal Commission?—Certainly.

223. Do you imagine that the warrant did not carry out the intentions of the Royal Commissioners by giving you the protection which the Commissioners recommended in their report?—The warrant of 1854 did not, but the warrant of 1858 did, and on the faith of that I held on to the service.

224. If I rightly understand you, in consequence of your having regained your position by the warrant of 1858, you remained in the service, which you would not have done if it had not been for what you considered that act of justice done to you?—There was no intentional injustice, I feel well assured; but mistakes and oversights will occur. In my own instance I have already suffered enough by the loss of my appointment. I had qualified myself for the staff at the senior department, Royal Military College, Sandhurst, in 1834, and I am now still further threatened to be superseded by 21 juniors on the ostensible plea of their having been promoted for service in the field in 1855–56—that is 12 years subsequent to my first promotion for field service to brevet-major and C.B. in 1843. By the warrant of 1858 I regained my position in the service and was fully protected from injury, and resolved to remain in it, otherwise I had seriously contemplated selling out, as I had just returned from five years' service in the West Indies, making a total of 25 in the tropics out of 34 years continuously on full pay.

225. Will you explain what it is you complain of with regard to the staff appointment?—I am willing to submit to that loss if the public good requires it.

226. What was it?—I had been deputy adjutant-general of the Windward and Leeward islands; I could have held that appointment until I came to be major-general, or I could have commanded the 22nd regiment without purchase; I could have held that until I was a major-general, in fact, I gave up regimental for staff employ.

227. Was it the new regulation introduced by the warrant of 1854 which prevented your holding that appointment for more than a certain period of time?—Yes; all my predecessors held that or another; after five years they were usually transferred to the home staff and continued on it till promoted to major-general; there was not a year of my life when I was not in the midst of pestilence and disease there; one epidemic swept off 20,000 of the inhabitants in the course of a few months.

228. Did I rightly understand you to say that you had obtained that staff appointment in consequence of having passed through the military college?—I cannot say that it was in consequence of that; I had qualified myself, and there were not many in those days who had done so. For 20 years I had sought it, and at last Sir Charles Napier recommended me for promotion in consideration of my services. I was six years a brevet major after that campaign in Scinde; I was six years a brevet major and four years a regimental major. I was one of the oldest majors in the army, and I had given a full equivalent for the appointment, as I conceive.

229. Did you obtain the brevet from seniority?—No; after the campaign in Scinde was over the despatches were received home. The last action was fought on the 24th of March 1843—the action of Hyderabad—in which I commanded 22d regiment. I got promoted for that, but not until the 4th of July, for the gazette of that campaign came out on the 4th of July. They took their time to consider. It may perhaps be comparing small things with great to compare that war with the Crimean war, but I may observe that there was only one Queen's aide-de-camp made at that time, an old Bengal officer named Pattel who had been 30 to 40 years in the service. It little mattered to any of us in the Queen's service whether he was promoted or not, but he was the only one made, and he was not made a Queen's aide-de-camp till 4th July 1843.

230. (*Maj.-Gen. Sir W. Brereton.*) You mean to say, that although it is perfectly true that on being made a Queen's aide-de-camp a lieutenant-colonel becomes a full colonel, you believe that that rule was so sparingly applied, as in the instance which you now quote, that only one Queen's aide-de-camp was made after that campaign?—And that an officer of the Bengal army. Lieutenant-Colonel Pennefather was there also, and dangerously wounded at Meeanee; he was senior Queen's officer, and, after Colonel Pattel, next in command to Sir Charles Napier; yet he (Lieutenant-Colonel Pennefather), was only made a C. B. on 4th July 1843, and was not made Queen's aide-de-camp till 1846, being then 28 years in the service, and even then he was thought lucky to be made aide-de-camp to the Queen so soon, or even at all.

231. Then, in point of fact, what you complain of is that the warrant of 1854, has had an *ex post facto* effect?—With me it has had nothing but a retrospective action. I was a lieutenant-colonel on the 4th of February 1853; that appointment was offered to me, I did not ask for it, I had been 20 years in the tropics already, Lord Hardinge knew that, when I told him that, although it was the first appointment which I was offered, I must decline it; he said: "I "will give you a fortnight to think of it, go back to "Brighton, I will not receive your answer under a "fortnight; if you accept it, I will give you six "months' leave in addition on account of your "health."

232. (*Chairman.*) I believe your complaint may be very shortly summed up, namely, that you objected to the operation of the warrant of 1854?—I did, as to its retrospective action.

233. That having been rectified by the warrant of 1858, you object to any re-consideration of that warrant?—I considered that final. After the careful examination it underwent by the Select Committee in 1861 again, surely it was to be hoped that we should have an end of all this agitation. I solemnly declare I would not have remained an hour in the service, could I have foreseen the annoyance which I have been exposed to for four years past.

234. Do you consider a state of uncertainty to be very detrimental to the true interests of the service?—I consider it most prejudicial to discipline and likely to weaken all authority. Who are we to look to now? We must go to the House of Commons, and not to the Horse Guards or War Office.

235. Do you consider that the Commissioners overlooked you in their report in 1854?—In the report they did not overlook us; it was in the warrant we were overlooked. That was set right by the Commission of 1858, and that rectification was accepted by the army and the service at large as a final settlement. It was raked up again in 1861, and now it is going on in 1863. Where is this to stop? I conceive that we are entitled to be clear of all this. I say, let me be secured in my position. I do not question the prerogative at all. I believe I am one of the few staff officers removed from my appointment in consequence of that warrant who have never been employed again, but I am willing to submit to that if younger men are better men. I was only placed in the list of colonels in 1858, where the Commissioners evidently intended I should have been in 1854. Were that so, there could have been no complaint from the distinguished colonels or from any quarter.

236. (*Lieut.-Gen. the Earl of Rosslyn.*) You were actually colonel in 1854, were you not?—By the warrant of 1858; that made me so.

237. (*Gen. Sir G. Brown.*) You were a lieutenant-colonel a little more than a year, I think?—On the 4th of February 1853 I became lieutenant-colonel.

238. You were only a lieutenant-colonel for little better than a year then?—According to the rectification.

239. According to the fact, you were made a full colonel in November 1854, were you not?—I was by the warrant of 1858, not till then.

240. You were a lieutenant-colonel in 1853?—Yes, on the 4th of February, 1853.

241. Then you were for a year and nine months a lieutenant-colonel?—Yes.

242. (*Chairman.*) No absolute length of service was required to enable a lieutenant colonel to become a colonel; you might have been made a colonel the next day, is not that the case?—I never heard of any distinction as to time, it depended on a general brevet, or being made aide-de-camp to the Queen.

243. (*Maj-Gen. Sir W. Brereton.*) If there had been a vacancy you would have gone up?—The promotion was not by vacancy, it was by periodical brevets, before that. I wish to remark that if that comparison is to be instituted as to the time for which the old lieutenant-colonels prior to that warrant were lieutenant-colonels, may I ask that that comparison may be carried out also with regard to those gentlemen who claim to be put over me; some of them went out to the Crimea as captains, and within 12 months they became colonels. If the short length of time between my lieutenant-colonelcy and my colonelcy is to operate against me, or is to be weighed in the balance, I make my claim on account of being a lieutenant-colonel before that warrant, and on the faith of the protection which ought to have been inserted, I believe, in the warrant of 1854.

244. (*Lieut.-Gen. the Earl of Rosslyn.*) What is the date of your commission as field-officer, as major?—The 4th of July 1843, after the campaign in Scinde.

245. Therefore, for 20 years you have served as a field-officer?—I have now been for 20 years a field-officer.

246. (*Gen. Sir G. Brown.*) You did not consider it a grievance when you were a lieutenant-colonel if the Queen chose to appoint an aide-de-camp over your head?—Not according to the old usage of appointing them, very sparingly, from the old lieutenant-colonels.

247. It was the established practice?—Decidedly, as long as I can remember.

248. (*Chairman.*) Do you know any instance of an officer being promoted from the rank of lieutenant-colonel to that of colonel without being made either an aide-de-camp or a distinguished service colonel under the new rule which was not in operation before 1854?—I do not know of any instance. Lieutenant-colonel Fox, though aide-de-camp to William the Fourth, remained a lieutenant-colonel for some years, and I think also another aide-de-camp from the Royal marines, so that the rank of colonel was not after all inseparable from aide-de-camp to the King.

249. (*Maj.-Gen. Sir W. Brereton.*) The only means by which a lieutenant-colonel could pass over the head of his senior lieutenant-colonel was by being appointed a Queen's aide-de-camp, was that not the case?—According to the usage of the service from time immemorial.

250. (*Chairman.*) You know of no instance of officers having been promoted from the rank of lieutenant-colonel to colonel without being made a Queen's aide-de-camp, or by those positions in the Guards which give the rank of colonel, previous to this warrant of 1854?—I never heard of anyone except a major of the guards, who was always major and colonel, and if promoted to major-general received 550*l.* a-year or 600*l.* a-year as unattached pay, if so promoted from lieutenant-colonel of the guards. Since 1856 majorities and lieutenant-colonelcies in the guards are succeeded to without purchase, and guards generals still receive 550*l.* or 600*l.* a-year as unattached pay, although their commissions now cost only 4,800*l.*, that is, 300*l.* above those of the line, and they are still eligible for colonelcies of line regiments, thus retarding the succession of generals of the line, who only receive 25*s.* a-day as unattached pay.

251. (*Mr. Bouverie.*) The question is, do you know of anyone being promoted to the rank of colonel as a reward for distinguished services not being made a Queen's aide-de-camp before the warrant of 1854?—I never heard of it. The only way you could obtain the rank of colonel was by being made a Queen's aide-de-camp; I never heard of any other, except a major of the guards.

252. (*Chairman.*) Although brevet rank was granted in the junior branches of the service, for instance, you would have a brevet major and a brevet lieutenant-colonel?—A brevet major for service in the field, also brevet lieutenant-colonels, both frequently.

253. Therefore, although it was usual in the junior branches of the service, after a major had once obtained the rank of lieutenant-colonel it became a promotion purely by seniority, with the single exception of the Queen's aide-de-camp?—Yes. I have often heard them complaining: "We must bide our "time hereafter, and wait till a brevet comes out "after the next five years," they might be cut off by a mere date and have to wait another five years.

254. However distinguished their services might have been in command of a regiment, previously to 1854 it was not the custom of the service to give the rank of colonel for those services?—I never heard of it. I would also hope that, if any remedial measure be deemed necessary for those gentlemen, it may be borne in mind that the Royal Commissioners said distinctly in 1854 and 1858 that distinguished or deserving officers should be rewarded at the expense of their country, and not at that of their senior officers; and that on that principle there are certain supernumerary generals still remaining, and they will merely succeed when it comes to their turn on the list, preserving their seniority. If in any shape or form 21 juniors are to be placed over me, either on the colonels' or major-generals' list, the injury to me, at my time of life, is irreparable, as they would succeed to colonelcies of regiments before me.

255. In consequence of your age it would be more likely to affect you injuriously?—It would be infinitely more likely to affect these 60 men injuriously by having the 20 men put over them, than it would be to affect the 20 by having the 60 remain where they are. I entered the service before all those in that list but one—he was in the army a year or two before me. I lose two places; there were only two lieutenant-colonels of 1852, and one was a lieutenant-colonel of 1850, and perhaps he is too high up to be affected; all of 1853 are my juniors, and probably 10 years or more younger than myself.

256. (*Gen. Sir G. Brown.*) They are above you in the list?—Those lieutenant-colonels of 1850–52 are of course above me, those of 1853, &c., below me, all being placed as colonels of 28th November 1854, as they stood by seniority on the old list of lieutenant-colonels prior to 20th June 1854, so that I maintain they were not overlooked in the revision of the warrant of 1858, nor by the Special Committee of 1861. If any remedial measure is required I hope and trust that it may be at the expense of the country and not at the expense of the senior officers. I solemnly declare I never would have remained in the service if I could have foreseen all this. I served long in the worst of climates to obtain this rank, which they have got in a moment, one brevet after another being heaped upon them. It cannot be said that it is a usual thing, even in the case of the Queen's aides-de-camp—it is a new thing to appoint them in such numbers and with such rapidity.

The witness withdrew.

Adjourned.

## At the War Office, Pall Mall, Monday, 18th May 1863.

PRESENT:

Lieut.-Gen. Right Hon. J. PEEL.
Right Hon. E. P. BOUVERIE.
Gen. Sir ALEXANDER WOODFORD, G.C.B., G.C.M.G.
Gen. Right Hon. Sir GEORGE BROWN, G.C.B., K.H.
Lieut.-Gen. Right Hon. the EARL OF ROSSLYN.
Major-Gen. Sir WM. BRERETON, K.C.B., K.H.
Major-Gen. HEN. SANDHAM.
Major-Gen. DAVID RUSSELL, C.B.
Major-Gen. RANDAL RUMLEY.

LIEUT.-GEN. RIGHT HON. J. PEEL, IN THE CHAIR.

*Col. J. S. Brownrigg.*

18 May 1863.

Colonel JOHN S. BROWNRIGG, C.B. Unatt., examined.

257. (*Chairman.*) You have made an application, I think, to be examined before this Commission, to make a statement in respect to the subject submitted to their consideration?—Yes. I may venture to say, first of all, that mine is a very peculiar position; I am differently situated, I believe, from every other officer concerned in this enquiry; I am a so-called distinguished-service colonel, and also one of those who have been affected by the retrospective effect of the warrant of 1858.

258. What was your position in 1854?—I was then a lieutenant-colonel.

259. Before the 20th of June 1854?—Yes; I am a lieutenant-colonel of September 1853. When the first batch of officers were recommended to be promoted for distinguished service in the field, after those who were made Queen's aides-de-camp in May and June 1855 (I allude to Colonels Lord West, Wilbraham, Borton, Edwards, Lysons, and Lord Longford), I was recommended by the Commander-in-Chief of the army in the field to be promoted at the same time that they were promoted. My name was excluded from that list by Lord Hardinge, who wrote, or caused to be written, a private letter to Sir James Simpson stating that he could not promote me, or that there were objections to my being promoted, because I was a guardsman. I am one of those who have never, for a moment, thought myself aggrieved or ill-treated by those who were promoted over my head as Queen's aides-de-camp; I consider that it is Her Majesty's prerogative and right to make any officers she pleases her aides-de-camp. I never imagined I was aggrieved by the promotion of my juniors in that respect, but having been recommended by the Commander-in-Chief in the field to be promoted for service in the field in the first batch, I did feel most hardly dealt with in being excluded from that list. I do not venture for a moment to say that I deserved it; there is an officer sitting amongst you who is a much better judge of whether I deserved it, or not, than I can be, but I do say this, that if I deserved promotion in November, when I was promoted, I equally deserved that promotion in July. With regard to the cases of the so-called distinguished-service colonels, I never felt that I had any right, and I never felt any satisfaction at being promoted over the head of a man like Sir Alfred Horsford, who has seen more service in the field than I have; but I did feel most deeply aggrieved by having my juniors (some four or five) placed over my head at the time they were so placed, namely, on the 17th of July, notwithstanding the recommendation which was sent home, with regard to myself, by Sir James Simpson. I was relieved from what I consider this act of injustice, by the retrospective effect of the warrant of 1858, and, for that reason, I would rather that matters remained *in statu quo*. If, however, the Commission consider that I have made out any sort of case, and if they consider, from what I tell them, that I was not fairly treated by my exclusion from that first list, I should venture very respectfully to hope that, if there are to be any further alterations in the list of colonels, my case will be taken into consideration. I claim to be placed, on the list next to Colonel Borton, who was the officer whom I should have stood next to in the list, had my promotion taken place at the time that I was recommended for it.

260. If you had not been recommended at all for promotion as a distinguished-service officer, you would, by the warrant of 1858, have been placed in your old position as a lieutenant-colonel, and have been senior, as I suppose you were placed senior, to those officers who were recommended for distinguished service?—Yes, that is exactly what has happened.

261. You were, in fact, senior to them?—Yes, to some of them.

262. You were replaced, by the warrant of 1858, in the position which you held with regard to those officers who had been recommended for promotion for distinguished service; in fact, you were placed senior to them, were you not?—To some of them. I was replaced above those who had gone over me. I was placed as I originally stood in the *Army List*.

263. I understand you to draw a manifest distinction, between those officers who were made Queen's aides-de-camp and those promoted as distinguished-service colonels?—Yes, I do.

264. You considered, did you not, being a lieutenant-colonel previously to June 1854, that you were at any time liable to be superseded by an officer selected by Her Majesty to be a Queen's aide-de-camp?—Certainly.

265. But you consider that the promotion of officers for distinguished service was one of the new regulations introduced by the warrant of 1854?—Yes.

266. The operation of which you object to, as affecting your interests?—Yes, because I was recommended for promotion by the commander of the army in the field, and his recommendation was not attended to.

267. Supposing you had not been recommended, your position being the same as those of all other officers who were lieutenant-colonels, and who considered themselves protected by the recommendation of the Royal Commission of 1854, did you consider that you were liable to be superseded by any officer who was appointed a Queen's aide-de-camp, but that you were not liable to be superseded by any officer promoted for distinguished service in the field?—Yes; I think there is the broadest distinction, between the Queen's aides-de-camp and distinguished-service officers. I think Her Majesty has a right, not only to make the subaltern of my company in the guards a Queen's aide-de-camp (as she was pleased to do), but my sergeant, if she thought fit; but I think it is a great pity that officers should be selected to be promoted for distinguished service, unless they perform some such extraordinary action as to make it patent to all the world that they deserve it, so that there can be no question about their merits; I think the plan of selecting here and there lieutenant-colonels to be made full colonels for distinguished service, though in fact they have not performed more good service than others, will always have the effect of producing a great deal of jealousy.

268. You have stated that the objection to the recommendation of the Commander-in-Chief, who recommended you for promotion, arose from Lord Hardinge?—Yes.

269. On account of your being a guardsman?—So it was stated in a private letter to Sir James Simpson, which he communicated to me.

270. Are you aware that all the recommendations made from the Crimea went in the first instance to the Commander-in-Chief, that would be to Lord Hardinge, who would then submit them to the Secretary of State for War, and, though his Lordship might admit some of them if he pleased, the Secretary of State for War would decide the question. Are you sure that the objection did not come from the War Office rather than from him?—All I can say, in answer to that, is, that I distinctly remember the letter that was sent to Sir James Simpson; my impression was that it was written by the then Adjutant-General, Sir George Wetherall, and that the letter stated that Sir James Simpson's recommendation, that I should be promoted, had embarrassed Lord Hardinge in consequence of my being a guardsman.

271. What was the position which you held in the Crimea?—I was then assistant adjutant-general of the light division.

272. It was not as a guardsman that you were recommended, but as the assistant adjutant-general?—I never knew that I was recommended at all until Sir James Simpson spoke very kindly to me upon the subject, and appeared much annoyed that I was not promoted. I was first assistant adjutant-general of the first division, and after that I joined the division which General Sir George Brown commanded, in a similar capacity.

273. Then, previously to the issue of the warrant of 1854, there would be no power, or at all events it was not according to the custom of the service, to have made you a colonel without making you a Queen's aide-de-camp?—No, I imagine not. I never heard of such a thing before.

274. (*Maj.-Gen. Sir W. Brereton.*) But, if you had been a colonel before that warrant was issued, no Queen's aide-de-camp could have been put over your head?—Not if I had been a colonel.

275. If you had been a lieutenant-colonel?—I never would venture to complain of Her Majesty's right to promote an aide-de-camp over me in such a case.

276. (*Chairman.*) If you had been a lieutenant-colonel previously to that you would have imagined that a Queen's aide-de-camp could have gone over your head?—Of course.

277. (*Maj.-Gen. Sir W. Brereton.*) Where do you stand now, next to Colonel Mackirdy, I think?—Yes.

278. (*Chairman.*) That is the position you hold as a lieutenant-colonel by the warrant of 1858?—Yes, where the retrospective effect of the warrant of 1858 placed me. I am in exactly the same position as if I had never been promoted at all, but I would rather remain as I am than have my juniors put over my head. I do not want to go over the heads of my seniors, but I have the strongest possible objection to having my juniors put over me; these juniors, according to General Lindsay's arrangement, would be, (including the Queen's aides-de-camp,) Colonels Troubridge, Dickson, Norcott, Gordon, Edwards, Lysons, Lord Longford, and Prince Edward of Saxe Weimar, eight in all.

279. (*Gen. Sir G. Brown.*) You would stand considerably higher on the list than you do now?—I should gain about 10 steps, I think. I should lose eight and gain about 18.

280. (*Lieut.-Gen. the Earl of Rosslyn.*) Then your position would be better?—Yes, but I would rather remain as I am.

281. (*Maj.-Gen. Russell.*) You have drawn a marked distinction, between the officers promoted for distinguished service and the Queen's aides-de-camp, have you not?—Yes.

282. I believe it is not usual, in appointing a Queen's aide-de-camp, to assign any reason for so doing?—I believe none whatever.

283. In the other case it is always stated that it is for distinguished service?—They are expressly gazetted "for distinguished service in the field."

284. (*Mr. Bouverie.*) On what date were you recommended for promotion originally?—I was recommended at the same time as those who were promoted on the 17th of July, and really all that I have to complain of is, that, being recommended, I was excluded from promotion at that time, although officers junior to me were promoted.

285. You would come in after Colonel Borton?—Yes.

286. At the time of the warrant of 1858, did you feel yourself aggrieved at all those officers being promoted over your head?—Not in the least, because they were originally before me. I did not care much about that, the only grievance I had was, that those who were promoted for distinguished service in the field should be put over my head—Colonel Edwards, Colonel Lysons, and Lord Longford, notwithstanding the recommendation of the general commanding the army in the field, who had the best opportunity of judging whether I deserved promotion or not.

287. (*Gen. Sir G. Brown.*) You consider that the grievance of having those half-dozen officers promoted over your head would more than counterbalance the 18 or 20 steps that you would gain on the list?—It is far greater; the one I consider as a positive injury, and the other as a mere sort of negative injury; it is a positive injury to have juniors placed over your head.

288. You would have become a general officer sooner notwithstanding?—Yes, so I should, but it would not alter my opinion that I was hardly treated in having junior officers promoted over my head. If I had not been recommended I should not have cared about it.

289. (*Chairman.*) The most important point in your evidence is the distinction which you draw between Queen's aides-de-camp and officers promoted for distinguished service. You stated that you made no objection to any number of Queen's aides-de-camp being placed over your head, but that, under the operation of that warrant, distinguished-service officers were placed over your head. Did I rightly understand you to say that?—Yes, and because I was recommended for promotion with the first batch who were promoted on the 17th July 1855.

290. (*Maj.-Gen. Russell.*) The Royal Commission of 1854 recommended that the "existing field officers "be allowed to rise by brevet as under the regulations "now in force," and then proposed some new regulations for officers not now of the rank of field officers, one of which was, that they should be promoted after three years' service in certain appointments, which was afterwards embodied in the 8th clause of the Royal Warrant. If that three years' rule were applied to the lieutenant-colonels then existing, would you consider it an infringement of your vested interests?—I should.

291. And against the clause of that Royal Warrant?—And, as it appears to me, against the clause of that Royal Warrant.

292. (*Maj.-Gen. Rumley.*) Nevertheless you do not object to your position in consequence of the warrant, as I understand?—I prefer my present position to that of having my juniors put over my head.

293. (*Chairman.*) Your present position by the warrant of 1858?—Yes.

294. You would rather be in the position which you now hold under the warrant of 1858 than that any alteration should take place?—Yes.

295. (*Maj.-Gen. Russell.*) Were you one of those who were passed over on the occasion of the first brevet on the 28th of November 1854?—I was passed over by some whom I had superseded by my promotion for distinguished service in November 1855, but I in like manner recovered certain steps I had, as I consider, unfairly lost.

296. (*Chairman.*) On the 20th of June 1854 were you a lieutenant-colonel?—Yes, I was a lieutenant-colonel of September 1853.

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297. (*Maj.-Gen. Russell.*) The warrant is dated in October, and the brevet came out on the 28th of November?—It did not affect me, because I was already a lieutenant-colonel.

298. You are in the same position as you always have been in at this moment, are you not?—Yes.

299. (*Mr. Bouverie.*) If all the lieutenant-colonels at the date of the warrant of 1854 had been breveted colonels you would have become a colonel, and would have occupied the place which you now occupy, and which you still wish to occupy?—Precisely.

300. (*Maj.-Gen. Rumley.*) Do I clearly understand that you did not object to the rectification warrant of 1858 having placed so many officers over you as to affect your position in October 1858?—I look upon that as a choice of evils; if I am allowed to remain as I now remain in the *Army List* I shall lose some ten places; I shall not be a major-general so soon as I otherwise should be by some ten places, but I prefer that position to having my juniors placed over my head, as they would be if General Lindsay's proposal is carried out.

301. Then did you consider the rectification warrant a grievance?—No.

The witness withdrew.

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Field Marshal H.R.H. the Duke of Cambridge, K.G., K.P., G.C.B., G.C.M.G., (*Commanding-in-Chief the Forces*), examined.

302. (*Chairman.*) Your Royal Highness was one of the Royal Commissioners appointed by Her Majesty in 1858 to consider the working of the warrant of 1854?—Yes. I wish to lay before the Commission a letter; it is from Sir Henry Storks to the military secretary: "War Office, 9th December 1858. Sir: In returning the enclosures of your letter of the 27th ultimo relative to the position of Colonel Sir Thomas Troubridge and Colonel Lysons in the list of the colonels of the army, I am directed to acquaint you, for the information of his Royal Highness the General commanding in chief, that Secretary Major-General Peel is of opinion that these officers occupy their proper places in the list in accordance with the Royal warrant of the 14th of October 1858, and he sees no reason to disturb the present arrangement."

303. It was recommended by the Commissioners of 1858, in their report, to replace all the officers who had been superseded by the effects of the warrant of 1854, was not it?—Yes, it was.

304. Was any evidence taken before those Royal Commissioners, or was their attention drawn to the cases of certain officers whose cases are now submitted to us by Her Majesty, and who considered that they might be ill treated, provided that all the officers were replaced in the position in which they had stood by the warrant of 1854?—I consider it was.

305. It was brought before them?—Yes, I consider so. I consider that it was brought before the Commissioners on the 28th of April 1858 in General Lindsay's evidence. Our attention was called to those particular officers.

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306. As you have already stated, the Commission recommended that all those officers, who had been lieutenant-colonels previously to the 20th June 1854, and who had been superseded by several officers in consequence of the warrant of 6th October of that year, should have their commissions antedated so as to place them in the same relative positions as those in which they would have stood in 1854 with regard to one another?—Exactly so.

307. Subsequently to the report of the Royal Commission of 1858 and the warrant, attention was directed to the case of those distinguished officers, I think?—Certainly.

308. In fact the very letter which your Royal Highness has put in shows it, it having been addressed, in the first instance, to the then Secretary of State, myself, in 1858?—Yes, exactly; that letter was dated 27th November 1858.

309. In July 1861, a committee was appointed, of which Sir Charles Yorke was chairman, and which reported, on 8th August 1861, General Lindsay dissenting from the report of the other Commissioners?—Yes.

310. In consequence of General Lindsay's statement a correspondence has taken place between the War Office and the Horse Guards and the Treasury?—It has.

311. With reference to that correspondence, there is a letter written from the War Office on the 26th January 1863 (at page 4 of the papers laid before us); it is addressed by General Forster to the Under Secretary of State for War, and he concludes by saying, "I have to add that it is proposed to discuss the subject at the meeting at the War Office on Wednesday next"?—Yes.

312. That meeting at the War Office is, I take for granted, one of those meetings established by your Royal Highness and myself, during the time I was Secretary of State for War, in which the Secretary of State for War, and the Commander-in-Chief, and the staff of both departments, meet for the purpose of discussing subjects in order to prevent needless correspondence, and, in fact, to settle matters by mutual understanding?—Yes, exactly.

313. Therefore I take it for granted that at such a meeting this subject was fully discussed between the heads of the departments?—Yes, between the heads of the departments.

314. That being on the 26th of January; on the 7th of February 1863, General Forster writes to the Under Secretary of State, which, I take for granted, is the official way of placing on record what took place at that meeting: "I am directed to request you to acquaint Secretary Sir G. C. Lewis that the Field Marshal commanding in chief having further reconsidered the question, is of opinion that the objections to the proposal are so great that His Royal Highness does not feel justified in agreeing to it." I wish to ask your Royal Highness to favour this Commission by a statement of what the objections referred to in that letter are?—My objections are the original objections which I made to the proposal when it was originally made. I forget the exact date now; it was in 1858 I think when it was first mooted.

315. (*Mr. Bouverie.*) Your Royal Highness refers to Sir Charles Yorke's letter, dated the 26th September 1859?—Exactly, and I adhere to the opinion I expressed in that letter. I will amplify my reason, if the Commission will allow me. I consider that the officers complaining have never been superseded, and for this reason, because I consider that the warrant of 1858 corrected an error in the warrant of 1854. The warrant of 1858 did that which ought to have been done, and which it was acknowledged ought to have been done, in 1854; consequently, if what ought to have been done in 1854, which was done in 1858, had been done in 1854, those officers never would have gone over the heads of those who they now complain have superseded them. Therefore in equity I consider that they never have been superseded.

316. What was done in 1858 was really done as a correction of what was done in 1854, was it not?—I consider that what was done in 1858 was a mere correction of an error in the warrant of 1854, and that, therefore, whatever occurred in the meantime, until that correction was made, was really as nothing as regards the position of those officers.

317. (*Chairman.*) The Royal Commissioners of 1854, in their report, recommended the introduction of two new means of appointment from the rank of lieutenant-colonel to that of colonel?—Yes.

318. The one being by a three years' service and the other by promotion for distinguished service in the field?—Exactly so.

319. At the same time they recommended that all existing interests should be protected?—Exactly.

320. Unfortunately the warrant of 1854 did not embody the recommendation of the Commissioners?—Exactly.

321. And the existing interests were not protected by the warrant of 1854?—Just so.

322. The consequence was that those officers were superseded constantly, by others having served three years, and the grievance became so great that, in 1858, your Royal Highness drew my attention to it, and it was agreed to appoint another Royal Commission?—Yes.

323. As I understand it, the present objectors, that is these 21 officers, admit the right of those officers who were lieutenant-colonels previously to the 20th June 1854 to be protected against the operation of any clauses in the new warrant of 1854?—Yes.

324. But they state that they would have been protected if the three years' rule had been applied to them, and if they had each been appointed to the rank of lieutenant-colonel on three years' service, and therefore they have no right to be protected against that which they were subjected to previously to the warrant of 1854—they were always subject to having Queen's aides-de-camp placed over their heads—and therefore they say they have no right to claim to be protected against that. The three years' service would protect them against any person being placed over their heads by three years' service, but it would not protect them against having officers placed over their heads for distinguished service in the field?—No.

325. Therefore, in order to protect them from the provisions of the warrant of 1854, it was considered, by the Royal Commission of 1858, necessary that they should be made colonels of 1854?—Yes, that they should be made colonels of 1854. I do not consider that the three years' rule is applicable to them, for this reason, because I consider that when these officers reached their rank of lieutenant-colonel the three years' rule did not exist—the consequence was that their birthright in the army was to go up without supercession. Now, to apply to these officers the three years' rule would be in principle most erroneous, because that rule did not exist when they ought to have been promoted, and therefore I object to their being put up by the three years' rule, which I know is now the position which they take.

326. (*Mr. Bouverie.*) Was that a matter considered by the Commission of 1858, with a view to meeting the difficulty created by the warrant of 1854?—I am not prepared to say that, but I think if mooted it would have been unanswerable.

327. Your Royal Highness would then have entertained your opinion as strongly as now?—Just so.

328. General Lindsay suggests on the part of these officers that the proper arrangement that ought to have been made in 1858 was not to promote all those officers from the date of 1854, but to promote them as they would have been promoted under the new warrant after three years' service; do you entertain an objection to that?—I do entertain an objection, because I consider that the injury done to those officers was done before that rule came into operation.

329. (*Chairman.*) Without doubting for a moment, but acknowledging at once, the undoubted power of the Sovereign to make alterations from time to time in the conditions of the service, do you not think it ought always to be done, as far as possible, by protecting the existing interests of those who have entered into the service upon certain conditions, and do you not, as Commander-in-Chief, consider that it is a great detriment to the army that there should be a state of uncertainty prevailing as to the relative positions of officers being from time to time changed by different warrants and different regulations, without protecting the positions of officers who have obtained their promotion under certain conditions?—I think nothing could be so objectionable as a constant change of system; I think, though probably, at the time, the change of system was essential, still all the vested interests then existing ought to have been protected up to the time when that came into operation. On that ground the warrant of 1858 was established to correct the error of 1854; otherwise the warrant of 1858 would have been an unjustifiable warrant. The object of the warrant of 1858 was to meet the objection which is now put forward so strongly, to meet the injustice to the service of making any regulation retrospective, which it would have been if the warrant of 1854 had not been altered by the warrant of 1858.

330. I ask whether, in your position as Commander-in-Chief, you are aware that at the present moment there is very great anxiety amongst officers in the army as to changes taking place?—I think the feeling of the army, as far as my knowledge goes, is very much opposed to any change; and it is because of that, and because I think the feeling is a just one, that I have so strenuously and repeatedly objected to various proposals which have been made to put these officers up again in the list. I hope the Commission rightly understand the grounds of my evidence. I should personally regret exceedingly that these officers should be placed in a painful position to themselves, but I think it would be much worse, as regards the interests of the army, if you were to readjust the position of those officers, because you would injure, in my opinion, a very much larger number of officers by any change than the few officers now affected, and who certainly, by an accident, got up much higher than I believe could ever have been expected by them.

331. Do you consider that previously to the year 1854 no person could have been placed over the head of a lieutenant-colonel except by being appointed a Queen's aide-de-camp, or by certain ranks in the guards, which, I believe, give the rank of colonel?—Yes, that was the army regulation.

332. Did that exist previously to the warrant of 1854?—Certainly.

333. Do you not consider that there is a distinction, therefore, between officers promoted for distinguished service to the rank of colonel and those made Queen's aides-de-camp?—The appointment of Queen's aide-de-camp is a very old institution, and the other appointment is under the new rule.

334. Introduced by the warrant of 1854?—Exactly. I do not know any instance of a lieutenant-colonel being made a colonel over the heads of other colonels except as a Queen's aide-de-camp. I do not believe there is any instance previously to 1854.

335. Before that it was not the practice to make an officer a colonel out of his turn, except by appointing him a Queen's aide-de-camp?—Not that I know of, with the exception of the positions in the guards which you allude to; and also in the ordnance corps it was acknowledged, and understood by the army, that that rank carried with it the position of colonel.

336. (*Gen. Sir G. Brown.*) Might I ask your Royal Highness whether the lieutenant-colonels existing in 1854 would not have had all their interests protected by being put in the same category, that is to say, by promoting them all, without reference to command or otherwise, at the end of three years in the rank of lieutenant-colonel?—No, I think not, because I consider that, though there may have been a great many in that rank who had only recently become lieutenant-colonels, yet I think it was their inherent right not to be superseded as lieutenant-colonels, they being already lieutenant-colonels at the time of the warrant, and therefore I consider that that accidental advantage was legitimately their due; and that applying the three years' rule to them would have been an injustice to them.

337. Those who had commanded regiments obtained their promotion at the end of three years' service, but those who were not employed remained out of the promotion for three or four years I think?—I think

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the true rule was to promote every officer who had the rank of lieutenant-colonel up to the date of that warrant coming out; from that time the matter takes a new start, and then you could apply any rule you liked, but up to that period they had a real right and a vested interest in not being superseded; I do not consider that we had a right to supersede anybody.

338. (*Mr. Bouverie.*) Was your Royal Highness chairman of the Commission of 1858?—No; Lord Herbert was chairman. I was a member of the Commission.

339. Was the case of those officers who had been promoted in the interim in consequence of distinguished service, or from any other reason, duly considered by that Commission?—I consider that it was. It will appear so by referring merely to the evidence of General Lindsay, which I have already alluded to. Will you observe question 31, which I will read, of General Lindsay's evidence, "*pro tanto* "that increase of the full-pay retirement was an "advantage, not only to the men who took it but to "those below them who did not take it?" At the end of question 31 General Lindsay answers that "in "the same position in which he formerly was there "are 21 officers who had been promoted for distin- "guished service in the field who have been passed "over." That is the first allusion. Then, again, to question 71 this answer is given—the question put was "Do you consider that by that arrangement you "will get all those officers to stand in the same rela- "tion to one another just as if the warrant had never "been in operation." The answer is, "No doubt of "it. But there is one class of officers who intersect "them, and those are officers who have been pro- "moted for distinguished service, and they will "occasionally intersect their dates." Again, in No. 74 the question is put, "But if an officer being a "lieutenant-colonel is promoted to colonel for dis- "tinguished conduct in the field, he would not carry "anybody up with him, would you not consider "that an exceptional case?—Yes, in this way, if "what we are calling justice was given to those "officers who are passed over, they would have been "promoted to colonel before the officers who were "promoted for distinguished conduct in the field, "and therefore they would be above them. In that "way the officers who are promoted from lieutenant- "colonel to colonel will be affected, and in no other "way."

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340. (*Gen. Sir G. Brown.*) That would imply that it had been considered by the Commissioners, certainly, would it not?—Yes, that is so. Again, in No. 75, I asked the question, "You would "make an exception for distinguished conduct?— "Yes, but I wish to be understood when I say an "exception in favour of distinguished conduct. They "would fall into their places according to the altera- "tion of the dates of others," clearly proving that the subject was brought under our notice.

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341. If the three years' rule had been applied they would have fallen into their places all the same?—Yes. In question 76 the Chairman asks, "You want to "make a retrospective correction of the list before "you will deal with those officers as to distinguished "conduct?—Yes, but I would not alter the date of a "single man who had been promoted for distin- "guished conduct in the field." Question 77 is, "You would not apply your rule as to moving those "men up to cases where officers were promoted for "distinguished conduct in the field?—Certainly not." So I think I am justified in saying that this question was brought to the notice of the Commissioners of 1858. In explanation of Sir James Scarlett's evidence I would remark that Sir James Scarlett was not present on that day, and therefore his stating that he did not know it of course goes for nothing, because it is the business of every member of the Commission to read the evidence given when he was not present; his stating, as he did before Sir Charles Yorke's committee, that he did not know that it was brought forward, I venture to say is hardly justified in consequence of what I have now brought before the notice of the Commission.

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342. (*Gen. Sir G. Brown.*) Is your Royal Highness of opinion that this Commission ought to make any distinction, in disposing of their case, between the Queen's aides-de-camp and the class of officers who were promoted merely for distinguished conduct in the field?—Not with reference to the colonels made by the correction of 1858, certainly not.

343. Is your Royal Highness of opinion that we ought to make any distinction, in disposing of the case of the officers, between the aides-de-camp and the distinguished service officers?—No

344. There ought to be no distinction?—None at all.

345. (*Chairman.*) There was a distinction previously to 1854, was there not?—Certainly.

346. Between officers appointed Queen's aides-de-camp and distinguished-service officers, in fact there was no such power to promote lieutenant-colonels for distinguished service before that?—Exactly.

347. Therefore the lieutenant-colonels would have been liable to have been superseded by anybody appointed a Queen's aide-de-camp, but not by anyone else?—Certainly.

348. None of these officers ought to be placed higher on the list, in your Royal Highness's opinion?—No, because my principle is that in equity there never has been any supercession, whether by distinguished-service colonels or by colonels made Queen's aides-de-camp, because I consider that the warrant made in 1858 was a correction, and not a new system. I think that what took place in 1858 ought to have been done in 1854, and that therefore those officers, though apparently standing higher in the list than some others, in equity never did so stand, because I consider the same thing ought to have been done in 1854 which was done in 1858.

349. The recommendation of the Commission of 1854 was that the vested rights should be protected?—Exactly.

350. Those lieutenant-colonels had no right to be protected against the appointment of Queen's aides-de-camp, had they?—No; but the other officers were not appointed Queen's aides-de-camp till after the injustice had been done to them. I consider that injustice was done to those lieutenant-colonels in 1854, the distinguished-service officers were not promoted till 1855. The consequence was, that when the injustice was done to those officers, the distinguished-service colonels and the aides-de-camp had not been promoted, and therefore in equity I say they never superseded the others.

351. In order to explain the circumstances with regard to the letter which your Royal Highness has pointed out as having been written by my instructions, and the reference that was made to me, I would ask, although it is perfectly evident, from what you have read, that the cases of those officers were brought before the notice of the Royal Commission during the course of the evidence that was taken, there was no direct application, I think, from those officers to be heard before that Commission?—I do not recollect any. What I implied when I answered that it was known to the Commission was on the ground that the evidence of General Lindsay, or a certain part of it, bore upon the question, but I did not mean that there was any specific reclamation made by those officers; at least I do not recollect it, and we have no papers to show it.

352. Supposing they had made an application to your Royal Highness to be heard before that Commission, their case would have been referred, during the time the Commission was sitting, to that Commission?—Certainly; I, as one of the Commission, would have encouraged it instead of discouraging it, and I presume that the others would have done the same.

353. Therefore am I correct in saying that, although the subject was thus incidentally alluded to in the course of the examination, there was no direct application on the part of those officers?—Certainly not.

354. (*Mr. Bouverie.*) If the application of these 21 officers was complied with, I suppose the request could only be met by antedating their commissions so as to put them over the heads of the officers who are now over their heads?—That is the only way I can see of doing it. The result of the proposal made by the Treasury and War Office really involved making four officers among those who had been antedated, colonels, when they were lieutenant-colonels, majors, and captains. I thought that an extraordinary anomaly which of itself ought to show how unfairly the proposed change would have acted.

355. The remedy of 1858 was a remedy which operated by ante-dating the commissions of those officers who were passed over by the warrant of 1854, was it not?—Yes; they were all made colonels.

356. Are you aware whether antedating, to such an extent at least, had been resorted to in the army before?—I am not aware of it. I have not asked that question nor have I searched into the precedents, therefore I could not say, but I think not.

357. Therefore it was an anomalous proceeding?—It was.

358. Resorted to in consequence of the peculiar grievance of those officers?—It was.

359. Again, to antedate the commissions of a number of officers would be another anomalous proceeding in the army?—I think it would be much more anomalous to antedate the commissions of officers of a much junior rank; all the colonels, whose commissions were antedated by the warrant of 1858, were officers having the rank of lieutenant-colonel up to a certain date; but this proposal would antedate to the extent of three steps, for some men were captains at that time, and you would ante-date them to be colonels instead of being captains.

360. Your Royal Highness is then of opinion that antedating would be a very objectionable practice to introduce?—Most objectionable; I cannot conceive anything more objectionable.

361. (*Chairman.*) The antedating by the warrant of 1858 was an unprecedented act to meet an unprecedented claim, was not that so?—Yes, just so, but I do not think that in any army in the world you would find that such a thing had happened as to antedate three steps at once, and that is what this would amount to in the case of four officers.

362. (*Maj.-Gen. Sandham.*) Would it be possible to antedate a Queen's aide-de-camp's date of commission?—It has never been done hitherto, because there has been no cause for it, but there would be no impediment, I suppose.

363. (*Gen. Sir G. Brown.*) Is it not the case that if the three years' rule had been applied to all lieutenant-colonels generally, in 1854, this question would never have arisen?—I should be very sorry to answer that question in the affirmative, because there is such a spirit of cavilling at any changes that are made, that I think, whatever had been done, somebody would have complained.

364. If those lieutenant-colonels had all been put up to the rank of colonel at the expiration of three years from the date of their lieutenant-colonelcies, the Queen's aides-de-camp and distinguished-service officers would have come in in their natural places according to the dates of their appointments, would they not?—How can you with justice apply one rule to men who were appointed under another rule?

365. If in 1858 you had given them all rank alike, would it not have been considered a very great boon?—I can only answer the question put to me by saying that my argument is simply this, that the officers of lieutenant-colonels rank, prior to the warrant of 1854, were entitled, by virtue of their position, to have no supercession, with the exception of the promotion of Queen's aide-de-camp, and officers in those positions in the guards and ordnance corps which were acknowledged to carry the rank of colonel; any supercession, other than that would, in my opinion, have been considered a grievance; and therefore I say that, although those officers may have benefitted, and some no doubt did greatly benefit, by being put up at once, they were entitled to be so put up rather than be superseded by anybody else.

366. The supercession by the distinguished-service officers was introduced by a new regulation, was it not?—Certainly.

367. And as regards the three years' service rule, protection was given?—I think there is no justice to the army in applying the three years' rule to get out of a difficulty which I admit exists, but which would not justify such an act.

368. (*Gen. Sir G. Brown.*) Putting the distinguished-service officers aside for a moment, and taking the 10 or a dozen Queen's aides-de-camp, suppose you had applied the three years' rule to the whole of the lieutenant-colonels, whether in the command of regiments or not, they could have had no grievance if they had got their rank at the end of the three years, could they?—I think they would have had a very great grievance.

369. Setting the distinguished-service officers aside, the Queen's aides-de-camp had a right to go over them, had they not?—I consider that any supercession would have been a great grievance, and applying the rule, with respect to the three years, to officers to whom that rule did not apply up to that time, would have been considered, and would have been, a great grievance to those officers.

370. (*Maj.-Gen. Russell.*) Would it not have been in contravention to clause 8 of the warrant, which says "that field officers commissioned as such before the 20th June 1854 be allowed to rise by brevet?"—Certainly, in every instance the Commission of 1854 admitted that no vested interests were to be dealt with by the warrant, as the Chairman has stated, but that was not completely carried out in the warrant, and consequently there was a necessity for the Commission of 1858 to correct the error of the Commission of 1854. I can only look on the Commission of 1858 as having done so.

371. (*Chairman.*) If in 1854 the whole of the lieutenant-colonels had been made colonels at that time, there would have been no hardship?—There would not have been any supercession; as I say, I admit, that in the *Army List* there is apparently a supercession, but I consider that in equity there never has been a supercession at all, because I consider that those lieutenant-colonels ought to have been put up in 1854 instead of being put up in 1858.

372. The power of rewarding for distinguished service is not limited to the position which the distinguished officers hold on the lists of colonels or major-generals. There is a power of selecting them by your Royal Highness, is there not—for instance, a distinguished-service colonel might be made a major-general, might he not?—Certainly; it is not confined to one rank.

373. I mean to say that the power of rewarding for distinguished service is not confined to the position on the list of colonels; you are not obliged to promote the senior colonel; you take them in reference to their service in fact?—Certainly.

374. You might take anyone on that list and make him a brigadier-general to-morrow?—Certainly.

375. Therefore the power of rewarding those officers is not limited by their position on the list?—No.

376. (*Mr. Bouverie.*) The staff appointments are really the prizes of the profession, are they not, particularly in that branch?—Certainly they are; it has no reference to their position on the list.

377. I will read through the names of the Queen's aides-de-camp; is Sir Thomas Troubridge on the staff?—Sir Thomas Troubridge is at the Horse Guards.

378. Colonel Griffith?—No, he is in command of a regiment.

379. Colonel Smith?—He was on the staff as assistant adjutant-general in Ireland; he gave it up.

380. (*Gen. Sir G. Brown.*) He got a regiment, did he not?—He was on the staff.

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381. (*Mr. Bouverie.*) Colonel Percy Herbert is on the staff?—He is on the staff.

382. Colonel Dickson?—He was on the staff; having served the full period, he has now rejoined the regiment.

383. Colonel Norcott?—No.

384. Prince Edward of Saxe Weimar?—No, he is in the guards.

385. Colonel McMurdo?—He has a very good staff appointment.

386. Colonel Wetherall, is he on the staff?—He is on the staff.

387. Colonel Lake, is he?—Colonel Lake of the Indian service you refer to; he has a very good civil appointment; his case is a peculiar one; he was transferred, from a local regiment in the Indian service, to the line, for service during the Russian war.

388. For service at Kars?—Yes; besides being made a Queen's aide-de-camp, he has been largely rewarded for his services.

389. Has Colonel Gordon any staff appointment?—He was on the staff, and now commands the engineers at Portsmouth.

390. Colonel Chapman, is he on the staff?—He is on the staff.

391. Are any of those officers paid aides-de-camp?—Sir Thomas Troubridge is, I know. I think they are all paid. I could not say off-hand. Colonel Herbert is, I know.

392. (*Maj.-Gen. R. Rumley.*) Some have good-service pension, I believe?—Yes; I think I may be permitted to say here, what I am very anxious to say, that I hope the Commission will understand that the answers which I have given were given on principle; in fact, what Mr. Bouverie has just elicited proves that it must be on principle, for most of those officers are actually in staff appointments at the Horse Guards, therefore it is not to be supposed that I can have any feeling against those officers; the whole question, so far as I am concerned, is a question of principle as regards the army, and not with reference to any individual.

393. (*Mr. Bouverie.*) My question was addressed with regard to the question of personal hardship to those officers?—Yes.

His Royal Highness withdrew.

*Col. F. E. Chapman.*

Colonel Frederick E. Chapman, C.B., (*Deputy Adjutant General R. Eng.*), examined.

394. (*Chairman.*) I believe you have expressed a wish to be examined before this Commission?—No; I came here by special notice.

395. You are one of the officers who were promoted for distinguished service, are you not?—Yes, in 1855.

396. In the month of November 1855?—Yes; the 2d of November 1855.

397. Do you not wish to make any statement to the Commission?—No.

398. Previously to the year 1854, the promotion from the rank of lieutenant-colonel to that of colonel was strictly by seniority, with the exception of those officers whom the Sovereign might select as aides-de-camp, or certain ranks in the guards and ordnance corps which gave the rank of colonel, was not that the case?—I believe it was. I believe Her Majesty also had the power to promote officers for distinguished service in the field.

399. Can you point out any instance of an officer, having been appointed a colonel for distinguished service in the field, except as a Queen's aide-de-camp before 1854?—I am not prepared to say at present, for I have not looked into that question.

400. You will see that it is most important, because the question is, whether you were appointed to the rank of colonel under the warrant of 1854, which introduced a new regulation, or whether it had been the practice before that time to appoint officers for distinguished service without making them Queen's aides-de-camp?—I am not prepared to say.

401. There can be no doubt that there is a distinction between officers appointed as Queen's aides-de-camp and officers promoted for distinguished service; that is to say, nobody will doubt for a moment the prerogative of the Crown to appoint any officer whom Her Majesty may please as Queen's aide-de-camp, without giving any reason for the appointment?—Yes, there is no doubt about that.

402. And although on the appointment of a Queen's aide-de-camp no reason is attached to that promotion, yet on the appointment of a distinguished-service colonel it is mentioned that he is appointed for distinguished service?—Yes, I always understood that the power was the same in each case. I may say that the only complaint we have to make is, that after enjoying the rank of full colonel for three years as distinguished-service colonels, we found ourselves by the antedated brevet put down below 115 other officers.

403. You were affected by the warrant of 1858?—Yes.

404. And your application now is, with the other 20 officers, to be replaced nearly in the position you were in, but not altogether?—Excepting those that have qualified and been promoted by the three years' rule, we quite think it fair and right for those officers who have served three years to go over our heads, provided they come in at the right dates; but we cannot see the necessity for the regulation which there was in the warrant of 1858 for antedating the whole of those officers, and putting all of them over our heads.

405. You think that they were fully entitled to be protected against that clause in the new warrant which placed other officers over their heads for three years' service?—Yes, but we do not think that it ought to have been done to the injury of our own interests; we think that our interests ought to have been protected likewise.

406. You think that those officers ought to have been protected against the one clause introduced into the new warrant, and not against the other?—I did not look at it as a clause in the new warrant at all before you put it to me in that way.

407. The passage which I pointed out to you was not in the warrant, it was a recommendation of the Royal Commissioners. The objection, on the part of the other officers, was, that the warrant of 1854 did not carry out the recommendations of the Royal Commission?—Yes, exactly.

408. That is the view which the Royal Commission of 1858 appear to have adopted, for they replaced all those officers in the position which they would have occupied, supposing that the brevet of the 28th November 1854 had included the whole of the lieutenant-colonels at that time?—Yes; what we consider is that, having been promoted on the 2d of November 1855, our interests were not sufficiently protected when the warrant of 1858 came out.

409. Do you imagine that the position of this class of officers was not sufficiently brought before the attention of the Royal Commission of 1858?—I think it was not sufficiently considered.

410. Were you examined as a witness before that Commission?—I was not.

411. Were you, as a distinguished officer, represented in any way before that Commission of 1858?—I do not recollect, I was not much interested about it at that time.

412. (*Lieut.-Gen. the Earl of Rosslyn.*) If the warrant of 1858 had not had a retrospective effect what would your rank have been now—that is to say, if it had not given promotion to officers over whose

heads you had passed?—I should have had the last promotion to major-general.

413. The practical effect of that warrant upon yourself is, that instead of being a major-general now you are a colonel?—Yes.

414. (*Chairman.*) Were you a lieutenant-colonel previously to the 20th of June 1854?—No.

415. (*Maj.-Gen. Russell.*) Would not the protection which you think was not afforded to your interests have been an infringement of the rights of the field officers, commissioned as such before the 20th of June 1854, as described in clause 8 of the warrant of that year?—I do not see that it would, perhaps it is because I do not quite understand your question.

416. Those officers are to rise by brevet, are they not?—The lieutenant-colonels previously to the 20th of June 1854.

417. As I understand, you propose that they should rise after three years' service simply?—That is what a great number of them have done.

418. You would propose that those lieutenant-colonels, after completing three years' service, should all be promoted to the rank of colonel, thereby introducing you as a colonel before some of those who were antedated to the 28th of November 1854?—I think, if you look at the list, you will find several officers who were lieutenant-colonels previously to June 1854 who have qualified and been promoted under the three years' rule.

419. All who were lieutenant-colonels on or before the 20th of June 1854 were made full colonels by the rectification brevet in November 1858, and all with the same date, were they not?—Yes. I cannot see what necessity there was for promoting an officer who was a lieutenant-colonel on the 19th of June 1854 to be a full colonel of the date of the 28th of November 1854, that is to say, possibly within six months of his becoming a lieutenant-colonel, and he might be an officer who had gone on half-pay, or had been staying at home to suit his own convenience, while the officers promoted for service in the field had been working out all their time and had earned their promotion.

420. How do you propose to guarantee the rights under the 8th clause?—I would promote them all under the three years' clause.

421. That is applying the new rule to all, whereas the clause says only "to rise by brevet"?—Yes.

422. (*Chairman.*) Supposing in 1854, in order to carry out the recommendation of the Royal Commission, the whole of those officers had, on the 28th November 1854, been made colonels, it would have been no grievance to anyone, would it?—I cannot understand upon what grounds you would make them colonels six months after becoming lieutenant-colonels without having seen any service.

423. Upon this ground, that when they arrived at the rank of lieutenant-colonel, they did so with the perfect understanding that according to the rules of the service no other officer could be placed over their heads, except Queen's aides-de-camp and officers holding the positions in the guards, &c., which I have alluded to. In order to protect them from the introduction of the new rule, might they not have been made colonels?—Of course that would have been possible.

424. The only effect would have been to retain them in the same position as before; the mere being called colonels, instead of lieutenant-colonels, would secure to them no pay, it would only give them the relative position which they held, and no fixed period of service is required between the ranks of lieutenant-colonel and colonel; on the contrary, one of the rectifications was to date a great many officers' commissions as lieutenant-colonels one day and as colonels the next, therefore there was no time required by the rules of the service to intervene between the date of a lieutenant-colonelcy and of a colonelcy, was there?—If you throw aside the operation of the warrant of 1854, there was none until you substituted five years under the warrant of 1858.

425. But the Commission recommended that those officers should be protected against the operation of that new warrant, did they not?—Yes.

426. But the warrant did not bear out that recommendation?—It did not protect the other officers who, between 1854 and 1858, had become full colonels.

427. But the warrant of 1854 could not refer to officers who were not appointed till after that warrant came out?—No.

428. Therefore you say now that if anybody neglected their interests it must have been the warrant of 1858 and the Commissioners of 1858?—Yes.

429. As I am responsible for the warrant of 1858, I beg to point out to you that it is in strict conformity with the report of the Commission. The warrant of 1854 neglected the recommendations of the Commission in not protecting those officers, but the warrant of 1858 carries out strictly the recommendations of the report of the Royal Commission, and if any hardship has been inflicted upon those distinguished officers, it is by their being passed over by the Royal Commissioners, and not in consequence of the drawing out of the warrant?—I understand that; but it appeared to us that clause 57 (I think it was that clause), in the report of the Commissioners of 1858, had not been embodied in the report. I may say that I am told there was no instance in the peninsular war of a promotion from the rank of lieutenant-colonel to that of colonel similar to the promotion of distinguished-service colonels. You asked me a question upon that subject just now

430. (*Maj.-Gen. Rumley.*) Now that you are aware of that difference in the positions of the Queen's aides-de-camp and the distinguished-service colonels, what is your opinion upon the claims of these officers?—I still think that the officers promoted in 1855 for distinguished service should not have officers put over them by an antedated brevet, men a great many of whom were at home on half-pay and who had not served their three years.

431. (*Chairman.*) Were not you placed over their heads by a subsequent rule which was not in operation when they were made lieutenant-colonels?—Most certainly I was.

432. (*Mr. Bouverie.*) If it had been reversed, if you had been a lieutenant-colonel in 1853, and had had a claim to promotion by seniority only, without reference to distinguished service, and if a subsequent change had been made, so as to give promotion for distinguished service, should you not have thought yourself aggrieved if officers had been promoted for distinguished service over your head?—I suppose I should; but take the present case, if any officer was promoted over my head at the present moment for distinguished service, I should not object to that at all. If the colonel below me was made a major-general for distinguished service to-morrow I should not object to it.

433. Could he be so promoted?—Yes.

434. He must be made a brigadier, must he not?—No, there were several promoted for distinguished service at the end of the last war.

435. You were appointed, subject to the warrant of 1854, and that was a portion of it, but a major-general could not have been placed over the heads of those officers who were colonels previously to the warrant of 1854, without theirs being protected, and many colonels were made supernumerary major-generals in order to protect them?—Yes.

436. There is a distinction between those who were colonels in the early part of 1854 and those who were made colonels subsequent to the warrant of 1854, because they were evidently subject to the provisions of that warrant, and it was notified to everybody on the 20th of June 1854, that all the appointments would be subject to that warrant?—All the major-generals promoted for distinguished service after the late war were made so under the warrant of 1854, although they were made supernumeraries.

437. The major-generals who were made supernumeraries did not come into their places, did they?—They received the date of their commissions from the time when they were first made supernumeraries.

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438. The supernumeraries have ceased now?—Yes, I believe so.

439. The system was only intended to preserve the rights of those who were colonels previously to the warrant of 1854?—Yes.

440. Was not it the fact that a supernumerary number of major-generals was granted in order to protect those who were colonels previously to the warrant of 1854?—Yes, but they went over the heads of those officers. They took the dates of their commissions as supernumerary generals. There is no protection, so far as I can make out, because a junior goes over the heads of all his seniors.

441. Those officers who were colonels then became major-generals as soon as they would have done originally, did they not?—Exactly, but they had men put over their heads as supernumeraries who remain senior to them as major-generals.

442. They were senior to them in point of rank as major-generals, were they not?—No.

443. They did not lose a step?—Yes.

444. All those colonels who were appointed subsequently to the warrant of 1854 were appointed subject to that warrant, and there was no protection to them?—I think so. The difference is because you have a fixed number of general officers, and it is only respecting the rights of all the officers in that number, if you make a batch of major-generals for service in the field, that they should be made supernumeraries. It protects their rights as to the number, but not as to the date of their commissions, and it would make a difference as to promotion to the rank of lieutenant-general afterwards.

445. Then on your being made a colonel their rights were not protected, because there was no supernumerary list; you would have gone up before those colonels over whose heads you were appointed, they would not have been protected in any way?—No.

446. The colonels were protected as far as their pecuniary interests were concerned; they would be major-generals just as soon as before?—Yes; there was the same number above them, irrespectively of those promoted for service.

447. (*Maj.-Gen. Russell.*) If the lieutenant-colonels, whose commissions were dated prior to June 1854, had originally been promoted, in the general brevet, issued consequent upon the promulgation of the warrant of 1854, would you have been satisfied with your promotion and the position you had attained as junior to them?—I must have been, because I should not have been promoted to be a full colonel until after those officers were made brevet colonels.

448. Your dissatisfaction, then, is entirely caused by having for some time appeared in the *Army List* as senior to those officers?—Not altogether. I consider that the warrant of 1854 established the promotion of lieutenant-colonels to full colonels for distinguished service in the field, but in the revision of that warrant in 1858 I consider that protection should have been afforded to the officers who were promoted for distinguished service in the field; their interests should have been protected by the provisions of the warrant of 1858. You accept that portion of the warrant of 1854 which provides for the promotion of lieutenant-colonels and colonels for distinguished service in the field, but afterwards, by the warrant of 1858, you overthrow the whole of the first part of the warrant, that is, with reference to the three years' service; you accept one part of the warrant and refuse the other; in revising the portion of the warrant with regard to the three years' service officers, you do an injury to those promoted under another clause of the warrant, viz., the distinguished-service officers.

449. Then you do not consider the clause 14 of the warrant of 1858 as remedying an injustice done to these officers?—It is that very clause to which we object.

450. You do not admit that any injustice had been done to the lieutenant-colonels previous to 1854 by the clause 8 of the warrant of 6th October not being acted upon in their case, namely, a general brevet; it states there that they should be allowed to rise by brevet?—You must read a little further than that, "be allowed to rise by brevet, as under the regulations then in force;" (but that was set aside, and it goes on to say:) "but no officer, promoted to the rank of field officer on or after that date, is to rise from the rank of lieutenant-colonel to that of colonel otherwise than by three years' service in the former rank."

451. I only refer to those who were field officers, lieutenant-colonels in fact, previously to 20th June 1854?—What appears to me is this, that in remedying clause 8 of 1854 by clause 14 of 1858, you did an injury to the officers promoted for distinguished service who had been promoted under the warrant of 1854.

452. Had no injury been done to the other officers which called for redress?—Why should you injure one set to right another?

453. I do not admit that one set was injured?—The very thing that is complained of is the injury caused by the second warrant.

454. I am assuming that those officers in 1858 only received what they ought to have had in 1854?—I cannot quite agree with your view.

455. (*Mr. Bouverie.*) Do you concur in the suggestions made by General Lindsay?—Yes; I concur in the suggestion which was read out just now by his Royal Highness the Duke of Cambridge.

456. That you should stand on the list according to the dates you would have held with the three years' service?—Yes, that we should be placed according to the dates we should have held with the three years' service officers.

457. (*Lieut.-Gen. the Earl of Rosslyn.*) You complain, do you not, that the vested interests, created between 1854 and 1858, were not protected?—The vested interests which were created by clause 8 in the warrant of 1854 were not protected by the clause of 1858.

458. (*Chairman.*) The other officers complain that previously to 1858 they were not protected by the warrant of 1854?—Yes.

459. That is exactly the position of affairs?—Yes, it is, and we consider that in revising the warrant of 1854 we were, to a certain extent, overlooked; there was a great deal of evidence given by Col. Lindsay before the Commission, which his Royal Highness read out just now, the recommendations of which were good, but were not acted upon.

460. I think his Royal Highness only read that to prove that it had been brought before the Commissioners?—Yes; under question 75, in answer to a question by the Duke of Cambridge, General Lindsay says, "I wish to be understood when I say an exception in favour of distinguished conduct. They would fall into their places according to the alteration of the dates of others;" that is, assuming that the three years' clause was carried throughout the whole of the promotions.

461. (*Maj.-Gen. Rumley.*) In the corps of royal engineers how are officers appointed colonels commandant?—They are appointed by seniority on the list of general officers.

462. By succession?—According to the dates of their commissions as major-generals.

463. By succession and not by selection then?—Yes, by succession.

464. By seniority?—Yes, in their army rank.

465. (*Maj.-Gen. Sandham.*) Is that without reference to service in the field?—We have had no case at present of selection; the last promotion was the recent one of General Walpole, which was taken on army rank.

466. From his first brevet rank?—Yes, dating as far back as a major.

467. In the case of General Forster was not that the case?—He was a Queen's aide-de-camp, and his promotion to major-general was consequent on the date of his commission as colonel and aide-de-camp, and he passed over three or four other officers.

The witness withdrew.

Brigadier-General JOHN ST. GEORGE, C.B., R.Art, (*President of the Ordnance Select Committee*), examined.

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468. (*Chairman.*) I believe you are one of the distinguished-service colonels whose cases are before us?—Yes.

469. Do you occupy exactly the same position as Colonel Chapman?—Yes, in that respect.

470. Are you aware of any instance of any officer having been appointed a colonel for distinguished service in the field, except as a Queen's aide-de-camp, before 1854?—No; I am not aware of any, and I never thought of looking for precedents.

471. Do you consider that you were promoted under the warrant of 1854, or that you were promoted according to a regulation that had been in practice before?—I should have thought that I was promoted according to a regulation which had always existed. I considered that the power of the Sovereign was not limited in matters of promotion.

472. Will you have the kindness to state anything you wish to bring before us?—I have rather separated my case from that of others; and I have not inquired much into the general subject; About 12 months ago I wrote a letter to the Under Secretary of State for War which contains nearly all I have to say upon the matter, and probably therefore I may be allowed to read extracts from it; it was dated 29th April 1862. "I am one of the 23 colonels who were supposed to "have received a step of rank for the Crimean war, "and I have hitherto refrained from intruding my par- "ticular case before authority, knowing that the gene- "ral subject was under consideration, and feeling sure "that there was every wish to do justice to all parties; "but as almost seven years have now elapsed, and as I "hear there are difficulties in the way of a general "readjustment which are considered almost insur- "mountable, I venture to separate my claim from that "of others, and to submit it altogether upon its own "merits. The letter of the Military Secretary of the "26th September 1859, written by the Commander- "in-Chief's directions, and addressed to yourself, says, "in reference to some of these lieutenant-colonels "(I being one of the number), that 'being full "'colonels previous to the war they could have "'obtained no further promotion, unless their ser- "'vices should have been of that distinguished "'character which would have justified their advance- "'ment to the rank of major-general from a very "'low position on the list of colonels.' I beg leave "to submit that my services were of that character "which might fairly justify me in expecting advance- "ment to such rank. I leave their value with full "confidence to the judgment of his Royal Highness "the Commander-in-Chief, and I have only to state "that the extent and responsibility of the command "I exercised for about seven months, and the "immense importance of its duties, were such as "should properly have been performed by a general "officer. I commanded the siege train of the "British army at the fall of Sebastopol. I had "under any exclusive command 29 companies of the "Royal Artillery, numbering between 3 and 4 thou- "sand men, and a detachment (under Colonel "Alexander, C. B.) of the Royal Marine Artillery, "while Captain Sir H. Keppell, commanding the "Naval Brigade received instructions from, and "made daily reports to me; and though I refrained "from any unnecessary interference in his case, "he had the courtesy to call upon me on appoint- "ment, and to assure me that he considered himself "under my orders. I had 200 heavy guns and "mortars in position, and all the materiel of the "siege under my direction. After the fall of "Sebastopol, I was recommended for promotion, and "my name was sent from the Horse Guards to the "Secretary for War, on the 16th October, 1855, for "submission, among others, to Her Majesty, for the "honour of Knight Commander of the Bath. I was not "promoted except to a rank which it appears I was "already in possession of, and the Secretary of State "submitted my name to Her Majesty for the 3d class "of the Bath instead of the 2d. The artillery officer "who held the same position as I did in the French "army, and commanded the artillery of the siege, was "a lieutenant-general, and the officer commanding the "British naval brigade in the trenches, who was at "least in some degree under the officer commanding "the siege train, always held the rank, and received "the allowance, of a brigadier-general; and I therefore "trust it will not appear presumptuous that, as I per- "formed the duties, I aspire to the rank of major- "general." My application was unsuccessful; but His Royal Highness conferred on me the temporary rank of brigadier-general.

473. I understand that the object of your reading that letter to the Commission was to show that you conceive that you would have had a claim for promotion on account of the distinguished character of your services?—On account of the extent of my command.

474. You consider that the position in which you were placed and the services in which you were employed were of such a character as would have justified your having an aide-de-campship or a major-generalship?—Yes, a major-generalship; I was a full colonel when I performed the services and was recommended for promotion, and, as I performed services which were those of a general officer, I considered that I should have been made one. I consider that it is admitted by Sir Charles Yorke in that letter that I had that claim.

475. By the warrant of 1854 was it not in the power of the Commander-in-Chief to have made you a major-general?—Several other colonels were made major-generals.

476. That power still exists, does it not?—I suppose so.

477. The claim is a claim to be considered, not by this Commission, but by the proper authorities?—I understood that this Commission was to consider the case of each officer who felt he was injured by the operation of the warrant of 1858.

478. Although the claim you put forward may be a very proper claim for consideration by the proper authorities, it is not a claim of the nature of those submitted to us?—No, and that rather explains why I have not entered into the subject which has been entered upon by General Lindsay and others. However in case my claim to be made a major-general is not entertained, then, as colonel, I claim to stand above Colonel Shuttleworth, because he did not complete three years' service as a lieutenant-colonel till the 7th of December 1855, whereas I was specially promoted over him on the 2d of November of that year. He has no claim to be a colonel of the 28th November 1854, but was only made such by the antedated brevet, which was acknowledged to be an oversight as regards the special promotions of 1855 by Lord Herbert, Sir F. Williams, Sir F. Smith, and Sir J. Scarlett, all members of the Commission of 1858.

479. How is your statement proved with regard to that, Sir James Scarlett and the others, because it would appear that Sir James Scarlett was not present that 'day?—It is in Sir James Scarlett's evidence; his words are "I do not remember their being dis- "cussed that day."

480. (*Maj.-Gen. Rumley.*) The only direct evidence is that of Sir James Scarlett?—I will make inquiries and shall be able to refer you to the authority for the assertions that I have made with regard to Lord Herbert, Sir F. Williams, Sir F. Smith, and Sir James Scarlett, all having been members of that Commission, and having acknowledged that it was an oversight.

481. (*Chairman.*) The committee go further than that, because they say they are of opinion that they ought to be replaced? He says, "This position on "the list was entirely overlooked, and their case was "not considered in the decision upon which the report

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" was founded, but that since his attention was drawn " to it he had given the subject much consideration, " and recommended that they should be replaced."

482. (*Mr. Bouverie.*) You are quoting General Lindsay's evidence, are you not?—Yes.

483. (*Chairman.*) The first application of the distinguished-service officers, after the report of the Commission of 1858, was made to me, I think, and we have had before us the answer that his Royal Highness gave to it. When was the next application made, that would be made to Lord Herbert, who was then Secretary of State for War?—I believe so. I will continue. If those colonels whose commissions as lieutenant-colonels were dated before the 17th February 1854 should object to my going over their heads on the ground that the 13th clause of the warrant of 1854 was a new rule, and equally opposed to their vested rights as the new three years' clause, still I claim the same consideration as the major-generals promoted by selection, who, when the colonels at the top of the list complained of being passed over, were made supernumerary major-generals, the public paying the extra expense incurred beyond that of the fixed establishment of major-generals. Unless this is done I am deprived entirely of my special promotion, because the authorities by an oversight promoted me under a new rule, which three years afterwards they found to be unjust to others; the intention of the Crown was to reward; if that intention is worthy of consideration, I have a right to claim the reward in some shape; and if it had been believed at the time that any doubt could have been thrown on the effect of the method adopted, I and others would have been made Queen's aides-de-camp, I suppose.

484. Then you admit that if those officers had all been made colonels in 1854, you would have had no right to complain because you had not been promoted at that time?—Not unless the authorities had sent in my name for promotion, and the Queen had directed that I should be promoted.

485. Previously to 1854?—No, in 1855.

486. My question is, if the general brevet, which came out on the 20th of June 1854, had included all the lieutenant-colonels that existed at that time, would you have had any right to complain because you had not been promoted then?—It would have taken me in also. I was one of them.

487. Then, the warrant of 1858 did replace you in your position?—It took me in, but I was in 1854 a full colonel in reality, though I did not know it at the time; that is the argument that I hold, namely, that being a full colonel, in point of fact, at the time of the Crimean war, I could not have got any promotion except that of major-general.

488. (*Mr. Bouverie.*) If the warrant of 1858 had taken effect in 1854 you would have been a full colonel, would you not?—Yes.

489. And then you would have been entitled to be promoted as a major-general?—Yes, if promoted at all.

490. That is a different point altogether?—That is my point, I am lieutenant-colonel of the 17th of February 1854, therefore of course I should have been a full colonel by this warrant of October 1854.

491. (*Lieut.-Gen. the Earl of Rosslyn.*) You would have got nothing more for distinguished service?—Not in the least; I am just in the same position as regards promotion, as if I had stayed at home. I wish to impress upon the Commission that I performed services which I think appear on the face of them to entitle me to expect a step of rank.

492. If you had been a colonel in 1854 you would have been made a major-general?—I suppose so.

493. (*Mr. Bouverie.*) On account of the position you occupied?—Yes.

494. (*Chairman.*) Suppose all the lieutenant-colonels had been made full colonels in 1854, and you amongst the rest, any officers who were made Queen's aides-de-camp subsequently to that would have had no right to complain of you and the others being over their heads, because you were over their heads previously?—None.

495. They say that in that case they do not get any reward by it. Do they not get a reward compared with all those who are serving in the same rank at that time; for instance, if a man is made a Queen's aide-de camp he would go over the heads of all the existing lieutenant-colonels, though he might be junior to many of them?—To be made a full colonel, certainly.

496. Supposing all the lieutenant-colonels up to June 1854 had been made full colonels in 1854, then, as I understand the case which is put, it is that these officers get no benefit whatever from having been made distinguished-service colonels or Queen's aides-de-camp. You get no benefit with regard to the former lieutenant-colonels, but you do with regard to those serving as lieutenant-colonels at that time, do you not?—I do not know the position of the *Army List*, but there would be very few to get over.

497. I speak of the general principle, without reference to individuals?—They would have passed over the heads of those officers who were not lieutenant-colonels before the 20th of June 1854.

498. They would have had all the advantages of the new warrant, commencing from a certain time, namely, the 20th of June 1854?—Yes, but my own case is different, because I was one of those officers.

499. Your case is a special one, for the consideration, not of these Royal Commissioners, but of those who have the power of rectifying it?—Perhaps so.

500. Your complaint is, "If you had done in 1854 " what you did in 1858, I must have been a major- " general by this time"?—Yes, as I assume I should still have been recommended for promotion at the end of the siege of Sebastopol.

501. Your complaint is, "You have kept me in the " position of lieutenant-colonel till 1858, and you did " not rectify it till too late to do me any service?"—Yes; the answer of his Royal Highness to my letter was that he regretted he could not entertain my claim at this remote period for the rank of major-general.

502. (*Maj.-Gen. Russell.*) With reference to your statement in which you say, "I claim the same con- " sideration as the major-generals promoted by " selection, who, when the colonels at the top of the " list complained of being passed over, were made " supernumerary major-generals," is not there this difference, that the list of general officers is limited in number, whereas that of the colonels is unlimited?—Of course that is the case.

503. That makes an essential difference, the one being a fixed establishment, and the other not?—Yes, but I don't see how that difference effects the claim I have put forward.

504. (*Chairman.*) But in fact the colonels were protected, in a pecuniary point of view at all events, from the effects of the new warrant of 1854 by the appointment of supernumerary major-generals?—They might have been in a pecuniary point of view, but I believe what an officer looks forward to is promotion, and his position in the army; and at any rate these officers are put over their heads, as I claim to be put over the heads of certain other officers.

505. Even as far as steps were concerned, they obtained the step of major-general as soon as they would have done otherwise, did they not?—Just as soon, but eight or ten officers were put over their heads, who wlil stop them in their attainment of the next rank of lieutenant-general, and will be made before them.

506. (*Maj.-Gen. Rumley.*) How are officers appointed colonels-commandant in the Royal artillery?—Generally by seniority in army rank.

507. (*Maj.-Gen. Sir W. Brereton.*) Always within the past six years?—Yes, I believe.

508. (*Chairman.*) It is a strict seniority promotion up to a certain point in the artillery, is it not?—The regimental promotion is strictly by seniority.

509. (*Maj.-Gen. Sir W. Brereton*). The giving of battalions is by army rank?—I believe there has been an exception to that lately.

510. There has been one exception—in the case of an officer who was not thought eligible *then* to be made commandant ?—That was the exception I referred to.

511. (*Maj.-Gen. Rumley.*) There is that difference then in the Royal engineers and the artillery, inasmuch as the colonels-commandant are appointed in those two corps by seniority, whereas in the line they are appointed by selection ?—The power of selection exists in the ordnance corps just as it does in the line.

*Brig.-Gen. J. St. George.*
18 May 1863.

The witness withdrew.

Colonel James W. Fitzmayer, C.B., R. Art., examined.

*Col. J. W. Fitzmayer.*

512. (*Chairman.*) We understand that you wish to be examined before this Commission ?—I wish to mention one fact stated in my note. I was promoted in November 1855 for services in the field. I found myself, in the year 1857, quartered with a colonel of engineers who had held a lucrative civil appointment during the time I was employed in the Crimea. I was about two years his senior ,and when the warrant of 1858 came out it made me nearly two years his junior; the only reason was that some four years before he had been promoted to the rank of lieutenant-colonel before the 20th of June 1854, I having been promoted on that date, and from that simple fact I lost the service of four years with reference to that officer.

513. Do you know the exact date of your commission of 1854 ?—Yes, I obtained two steps on the same day, it was the 20th of June 1854.

514. Then you would be one of those lieutenant-colonels whose vested interests were recommended by the Royal Commission of 1854 to be protected ?—No, I had no vested interests whatever. I was promoted on the 20th June 1854.

515. Do you not consider that the officers promoted to the rank of lieutenant-colonel before 20th June 1854 were only liable to be superseded in the rank of lieutenant-colonel by officers made Queen's aides-de-camp, or by officers holding certain positions in the Guards which give the rank of colonel ?—I never considered that there were any vested interests in the army as to promotion.

516. That was the custom at that time, however ?—There were several customs in my own corps which have been set aside since, it was the custom that no officer should go above a senior.

517. Previously to 1854, can you point out any instance of officers being appointed from the rank of lieutenant-colonel to colonel except in regular rotation, except the appointments of Queen's aides-de-camp and field officers in the household troops ?—No, I never heard of any. I don't know how it may have been in the Peninsula.

518. In the mean time you were a lieutenant-colonel of the 20th June 1854 ?—Yes.

519. When were you appointed a colonel for distinguished service ?—In November 1855.

520. You were then placed over the heads of a great many of those lieutenant-colonels, who I suppose were seniors to you in 1854 ?—Yes, and I gained regimentally by it.

521. In the *Army List* you were placed in a certain position by the warrant of 1854 ? —Yes, by promotion for services, undoubtedly.

522. And you remained in that position until the new warrant of 1858 came out ?—Yes I did, and to a partial extent afterwards.

523. That placed you, I suppose, at the bottom of the list of colonels of 1854, if your appointment was only on the 20th of June ?—It was the same day as the brevet of that year.

524. If you had been a lieutenant-colonel of the 19th of June, what would have been your position ?—If I had been a lieutenant-colonel of the 19th of June I hardly know where I should have been now. It was merely because the officer mentioned happened to be promoted a lieutenant-colonel a few days before I was (I believe it was only a week) that that officer became two years my senior by the warrant of 1858, or nearly so.

525. Supposing the warrant of 1854 had carried out the recommendation of the Royal Commission of 1854, and in order to protect the interests of the then lieutenant-colonels they had all been made colonels in 1854, you would have had no ground of complaint then, should you ?—I should have considered it a strange proceeding such a wholesale measure as that. It might have been reasonable to protect the officers who had no means of serving the three years in command to which the obtaining of the rank of lieutenant-colonel was limited, but I think no other officers had a right to any protection whatever ; any officer who had retired from any cause from the service, and could not possibly work out his three years in command, might have something to complain of, but I do not consider that anybody else had anything to complain of. At the utmost the lieutenant-colonels promoted to 20th June 1854 could only expect to be made colonels on the completion of three years service in the former rank, and if this had been done there could have been no cause of complaint anywhere.

526. If an officer was placed in a position in which he could not obtain his rank by the new warrant, but in which he would have obtained his rank according to the old custom, surely it was a hard case ?—If he had had the advantage of the three years clause in the new warrant from the date of his lieutenant-colonelcy, he would not have complained. He would then have attained the rank of full colonel much sooner than under the old system.

527. Still it could never have altered his position with regard to those senior to him, the merely making him a colonel in 1854 would not have altered his position at all, it is only calling him a colonel instead of a lieutenant-colonel ; he would have had no additional pay and no additional position ?— I am not aware that the position of colonel in the army gives any advantage as to pay.

528. I think you said you took a view of it regimentally ?—Not in the case mentioned with regard to the officer of the engineers, because we were in different corps. I could not understand why he became four years my senior for a transaction four years before that time — he had been promoted in 1854 and in 1858 he got four years' back rank.

529. In 1854 he was a lieutenant-colonel ?—Yes, before the 20th of June 1854, and he got four years' back rank four years afterwards, and was put over my head. He got the step of lieutenant-colonel and colonel in the same day. I complain of that.

530. Supposing there had been no warrant, this officer would have been senior to you when you met the first time, would he not ?—Only by a few weeks my senior.

531. Still he would have been your senior ?—Yes, certainly. I have not thought much of the matter, because I never took any active measure at all or endeavoured to exercise any pressure upon the government to get promotion. I have not given my mind to examine in detail what I may have suffered or gained by it. I merely wish to mention the fact I have done with regard to this subject, as an illustration : an officer who was quartered with me, and who, during the time I was in the Crimea held a lucrative civil appointment, nevertheless was put above me. There may have been other officers who may have suffered, and who, by the warrant of 1854, had reason to complain but I do not think he had, and, in fact, he admitted that to me when we talked it over ; he said he did not know why the change was made ; he did not seem to think he had any vested rights.

532. He was an engineer officer holding a civil position ?—At the time we met he was in command

*Col. J. W. Fitzmayer.*

18 May 1863.

of the Royal Engineers in Scotland, and I was in command of the Royal Artillery. He said he never could understand the cause of the change that occurred between us.

533. (*Gen. Sir G. Brown.*) Who was that officer?—Colonel Frome of the engineers; we were always very good friends.

534. (*Maj.-Gen. Sandham.*) He was in the colonies at the time, was he not?—He was in the colonies.

535. (*Maj.-Gen. Sir W. Brereton.*) The artillery officers are placed in this position, Colonel St. George, Colonel Ward, Sir David Wood, and Colonel Fitzmayer on the list of distinguished colonels of artillery, is not that correct?—Yes, we were all promoted together; we were the only artillery officers promoted at the time.

536. (*Chairman.*) Do you consider it detrimental to the public service that there should be uncertainty with regard to promotion and the permanence of the various ranks?—Every officer's promotion and position should be as secure as possible, but I consider the Government have an undoubted right to promote any officer they please, provided they have sufficient grounds as to his services and the nature of them for doing so. I should like to know the reasons why officers were put over my head, but if they were reasonable, I would be the last person to complain; in the case I have mentioned, the officer put over my head admitted that there was no reason, I therefore thought it rather hard, particularly as it was for a transaction four years before. I should not complain if an officer were put over me who had performed any distinguished service. I do not complain of Colonel Dickson's promotion, although the custom in our regiment was to look upon it that we should go by seniority.

537. He was placed over your head because previously to 1854 he had what was considered by the Commissioners of 1854 a vested right, was not that the case?—Not Colonel Dickson.

538. The other officer to whom you allude?—Yes, I suppose so, but he could not understand himself what the vested rights were which gave him two steps of promotion in the same day.

539. He was an engineer officer, I think you said?—Yes.

540. That is a strictly seniority service, is it not?—Both our corps are held to be so.

541. He would have been very much surprised if any officer of the Engineers had been put over his head, and you would have been very much surprised if an artillery officer had been put over your head?—I do not know. I think Colonel Dickson was put over my head for distinguished service; at this very moment I go over the heads of other officers by the warrant of 1858 in army rank.

542. Not in your regimental position?—They were regimentally senior to me.

543. They still continue regimentally senior to you, do they not?—Some of them became lieutenant-colonels the same day as I did. They are still regimentally senior, but the time will come when I shall go over their heads regimentally, such at least is the rule at present.

544. You would have been very much surprised if any officer had been placed over your head in the Artillery contrary to the custom that prevailed, would you not?—It was contrary to the custom if it comes to putting an officer over my head.

545. (*Gen. Sir George Brown.*) Both yourself and Colonel Dickson became lieutenant-colonels on the same day?—Yes; he is much junior to me regimentally.

546. (*Mr. Bouverie.*) Would you not have thought it rather hard that officers by any rule should have been promoted over your head?—Not for distinguished service in the field.

547. You have always supposed then that officers could be put over the heads of artillery colonels for distinguished service in the field?—Most decidedly. I should say it would be depriving the Government of a most important part of their authority if they could not place an officer over the heads of others for distinguished services.

548. (*Chairman.*) Can you mention an instance of an officer being promoted from the rank of lieutenant-colonel to that of colonel, for distinguished service in the field, without being made an aide-de-camp?—I only know that Colonel Dickson was put over my head.

549. Subsequently to the warrant of 1854?—No, without any warrant. Colonel Dickson was put over my head for distinguished service in the field. I never complained of it.

550. That was subsequently to 1854, was it not?—Yes.

551. I ask whether there was any instance of any officer being promoted from the rank of lieutenant-colonel to that of colonel, for distinguished service in the field, without being made an aide-de-camp?—I am not aware of it; it may have been the case in the Peninsula, I cannot say.

552. It was not the custom, whatever the rights of the Crown might be, to promote for distinguished service before 1854?—No; but I should not have made any complaint if an officer had been put over my head for distinguished service, and now I do not consider that I have a vested right in keeping my position where distinguished services are the fair grounds.

553. Do you not consider that you have a vested right in your position in the artillery?—I consider that nothing, but something very extraordinary would justify any act on the part of the Government, in putting an officer over my head, but I think if fair and sufficient reasons were given, I should not have any ground of complaint; if an officer distinguishes himself they cannot promote him without putting him over my head.

554. That is provided for under the warrant of 1854, is it not?—I think so. I think I have no individual right to be considered when the public service is concerned.

555. Do you not think, that when a new alteration, which is admitted to be an improvement, is introduced, it is desirable, if possible, to secure protection for all existing interests?—Yes, decidedly. I would make every officer secure in his position, if possible, but having reference to that question, if the Government feel justified in putting an officer over your head you may feel something with regard to it; you are very likely to do so, but you have no ground of complaint.

The witness withdrew.

*Col. J. Yorke.*

Colonel JOHN YORKE, C.B., Unatt., examined.

556. (*Chairman.*) I think you have expressed a wish to be examined before this Commission?—I wrote a letter to the military secretary, and I have written a memorandum which expresses all which I have not already said in my peculiar case; it contains all which has not appeared in the letter which I wrote a few months ago.

557. Will you read it?—"Sir,—I have been most "reluctant in defending my position in the *Army* "*List*, being unable to do so without personal refe- "rence to Sir Thomas Troubridge, which I much "regret, but our case was somewhat parallel, with "the exception that 277 lieutenant-colonels and up- "wards of 100 majors existed between us, just at the "time we were both rendered incapable of serving "in the field. Powerful influence, however, has now "been obtained in his favour, which is most detri- "mental to mine and others if not contradicted; I "trust this may plead as my excuse, and that I may "be permitted to represent my losses in contradis-

" tinction to his rewards. The former are as fol-
" lows: namely, the command of a cavalry regiment,
" in which I took the greatest pride, together with a
" large sum invested to obtain the same. 2d. Se-
" veral steps in the *Army List*, which the warrant of
" 1854 allowed me for a time. 3d. Subsequent
" loss of a staff appointment within the regulated
" period, with strong recommendations from the Se-
" cretary of State. 4th. Refusal of the Legion of
" Honour, though specially recommended for the
" same by the Commander-in-Chief; I am the only
" commanding officer undecorated with this insignia.
" 5th. Serious infirmity for life. I have no gains to
" balance against these losses, except a good-service
" pension, for which I am most truly grateful and
" content. It would be invidious for me to specify
" the rewards in possession of some who are now
" claimants for more, as they embrace rapid, re-
" peated, and gratuitous promotion, lucrative and
" permanent employments, special honours, &c., but
" as their interests have publicly been proclaimed
" (*as overlooked*), I humbly beg for similar conside-
" ration respecting mine."

558. You were a lieutenant-colonel of the 4th of February 1853, I believe?—Yes.

559. Previously to the sitting of the Royal Commission, and of course previously to the issue of the warrant of 1854?—Yes.

560. Did you consider as a lieutenant-colonel that you could only be superseded by officers who were appointed Queen's aides-de-camp, or by officers appointed as field officers of the guards?—Only by the Queen's aides-de-camp.

561. The rank of field officer in the guards has always carried with it the rank of colonel in the army, has it not?—I was not aware of it.

562. The power always existed, long before 1854, it was not a new power?—I have no doubt you are right.

563. You did not consider yourself liable to be superseded by anybody but those who, according to the rules of the service, would previously have been promoted over your head?—I certainly looked at the Queen's aides-de-camp as the only officers who could go over my head.

564. From time immemorial I believe certain positions in the guards have carried with them the rank of colonel?—Yes, I had overlooked this.

565. The report of the Royal Commission of 1854 recommended that your vested rights should be protected, and you had every reason to expect that they would be protected, against any new clauses introduced into the warrant which did not exist at the time you became a lieutenant-colonel?—Certainly.

566. Unfortunately the warrant of 1854 did not carry out the recommendations of the Commission of 1854, and you were passed over between 1854 and 1858?—I was passed over by a great many, and I went over a few.

567. Did you remain in the command of your regiment for the requisite length of time?—Yes.

568. At the end of the three years' service did you become a full colonel?—Yes, at the end of three years' service I became full colonel.

569. (*Mr. Bouverie.*) You became a colonel by virtue of the three years' service warrant?—Yes.

570. (*Chairman.*) When the warrant of 1858 came out, you were replaced exactly in the position you occupied in 1853, with regard to these officers, were you not?—Yes, just in the same position as regards officers of the line.

571. It would have been exactly the same if the general brevet, which took place on the 20th of June 1854, had gone down to the junior lieutenant-colonel of that time and taken them all in?—Yes.

572. Now those distinguished officers claim to be replaced in the position in which they stood between 1854 and 1858?—Yes.

573. And to that you object?—Yes.

574. That is the ground of your complaint?—Yes. I wrote a memorandum which embraces my particular case. I was too ill to receive my medal. I was superseded by Sir Thomas Troubridge.

575. You were wounded on the 25th of October?—It was in the Balaklava charge.

576. (*Mr. Bouverie.*) You received your medal from the Queen in person, did you not?—No, I was too ill. I received the same invitation to attend; I was too ill to attend, and I was superseded, and from that unlucky circumstance I was superseded during the whole war. I have written a short memorandum upon the subject. I believe the cause of my being superseded in the first instance was purely accidental; the same kind feeling was intended for me as well as others, but I was in a dangerous condition on the 18th of May 1855, and totally unable to respond to the commands of Her Majesty to receive my medal at her hands; I had therefore the mortification of being superseded on that day by Sir Thomas Troubridge, and hence followed my supercession during the entire war. Had I been present on that occasion, I have reason to suppose I should have been similarly rewarded, but singular misfortune then intercepted my prospects; I had to submit to 17 surgical operations in rapid succession, which frequently endangered my life, and placed me out of sight, and consequently out of mind, for nearly two years, during which period I was repeatedly superseded; the ninth year is now advancing, and I am again threatened with the same penalty (which I think is unmerited). I am naturally most anxious for promotion, having gained none by the war, but on the contrary I have suffered losses, and am debarred from general employment through the severity of my wounds. I have here a document in proof that Her Majesty was not unmindful of my sufferings, also that the adjutant-general was pleased to convey to me the Commander-in-Chief's approbation as to the state of my regiment during the first year of my command.

577. (*Chairman.*) You are the senior colonel of 1856, are you not?—I am put down there as the senior colonel I think. On the last list there were one or two of that date senior to me, but this list puts me at the head.

578. You obtained that rank by having completed three years' service, did you not?—Yes.

579. Is that the position which you hold now subsequently to the warrant of 1858, which put you back again?—No; Colonel George who appears below me here is now above me; it is a singular case, we were both lieutenant-colonels of the same day.

580. (*Maj.-Gen. Sir W. Brereton.*) What day was that?—The 4th of February 1853; his majority was earlier than mine, and when the matters were reversed in 1858 he got a step over me.

581. (*Mr. Bouverie.*) On that account?—Yes.

582. (*Lieut.-Gen. the Earl of Rosslyn.*) You stand in the *Army List* as a colonel of 1854, I believe?—Yes; in 1854 he was, I suppose, senior to me, but in 1856 I was senior to him, because I had completed the three years' service.

583. In 1854, though both commissions were dated the same day, he was senior to you?—Yes, the next in seniority above me.

584. And then when the warrant framed upon the recommendation of the Commission of 1858 came out, you were put in the same position as you had been in formerly, were not you?—Yes, I suppose so, as regards officers of the line.

585. Was it a brevet rank of lieutenant-colonel that you had in 1853?—No, I purchased the regiment.

586. What was it in Colonel George's case?—He was the deputy adjutant-general in Jamaica, so I am just told.

587. (*Chairman.*) The commissions were both the same date?—Yes.

588. And would be gazetted according to who was the senior major?—Yes.

589. The date of your lieutenant-colonelcy was in 1853?—Yes, the 4th of February 1853.

*. Yorke.*
*ay 1863.*

590. After the warrant of 1854 came out you went over his head as soon as you had completed the three years' service, was that not so?—Yes.

591. And then after 1858 he was placed back again over your head?—Yes, which was quite just.

592. (*Mr. Bouverie.*) If I rightly understand you, you consider it a great grievance that those officers should be put back again into their positions over you in consequence of their promotion for distinguished service?—Certainly.

593. (*Chairman.*) At the same time admitting that you were always liable to be superseded by Queen's aides-de-camp?—Yes; but I look for protection to the antedate, otherwise the warrant of 1854 has been reversed greatly to my disadvantage.

The witness withdrew.

*Col. Graham.*

Colonel HENRY HOPE GRAHAM, C.B. (*Inspecting Field Officer of the London Recruiting District*), examined.

594. (*Chairman.*) Is your case exactly similar to that of Colonel Yorke?—No, it is very nearly the same, except that I cannot lay claim to such distinguished service as Colonel Yorke.

595. I see by this list that you were a lieutenant-colonel of 1853, and obtained a colonelcy by three years' service?—Yes, by three years' service.

596. And then in 1858 you were put back again, were you not?—Yes, about 60 going over me.

597. Having been superseded in the meantime by the Queen's aides-de-camp and the distinguished-service officers?—Yes, but they are below me now.

598. Before you were reinstated by the warrant of 1858 you had been superseded by those officers appointed Queen's aides-de-camp and distinguished-service colonels?—Yes.

599. Did you consider when you were appointed to the rank of lieutenant-colonel that you were not liable to be passed over by anybody, except by the Queen's aides-de-camp and by officers holding the positions in the guards which carry the rank of colonel?—Certainly.

600. And then when the new warrant came out, founded upon the report of the Royal Commission, which had expressly recommended that the vested interests ought to be protected, you thought that you ought to be protected under that new warrant from being superseded by anybody but those by whom you were liable to be superseded before?—Yes, that is by Queen's aides-de-camp. I went over the heads of about 60 officers by qualification, and those 60 went over me again, and now the distinguished colonels want to go over me.

601. (*Mr. Bouverie.*) The 60 colonels went over you by the warrant of 1858?—Yes.

602. (*Gen. Sir G. Brown.*) That warrant replaced them in the position they held before, did it not?—Yes, the clause of the warrant by which I got promotion after three years' service was ignored as I consider by that.

603. (*Chairman.*) Do you not consider that, if in 1854 you and all the other lieutenant-colonels had been made colonels, which was the measure adopted in 1858, nobody would have had any cause of complaint?—No, I suppose not.

604. You could not complain at all of being kept in that position?—Certainly not.

605. And those officers who would not have been made distinguished-service colonels until after that, would have had nothing to complain of because you would have been senior to them?—Yes, just so.

606. Have you any special case?—No; I commanded my regiment in a very bad climate in the hopes of getting colonel's rank, and it went for nothing; the same number of officers that I went over were put over me again.

607. Having been, I will not say dissatisfied, because no officer is ever dissatisfied, but disappointed by the operation of the warrant of 1854 and afterwards compensated by the warrant of 1858, you think it very hard that you should be again superseded?—Yes, by the distinguished officers.

608. You have no right to complain of being put in the position you have been placed in, have you?—No.

609. You cannot claim the advantages of the warrant of 1854, and then turn round and complain of the other part of it?—No.

610. You cannot say, I wish to go up by the warrant of 1854 as far as the three years' service is concerned, because that places me higher on the list, but I object to the warrant of 1854 because that places distinguished-service officers over my head?—No, they must both be taken together.

611. You consider, do you not, that the warrant of 1858 only did an act of justice by replacing the officers who had been injuriously affected in their former positions on the list?—Certainly.

612. (*Gen. Sir G. Brown.*) You would have been perfectly satisfied if the warrant of 1858 had appointed you a colonel on the 29th of April 1856, should you not?—That is what I was by the warrant of 1854.

613. You would have been perfectly satisfied if you had obtained the rank of colonel in 1856 instead of 1854, should you not?—Provided the other 60 officers were kept junior to me.

614. (*Chairman.*) It is not the date of your promotion but the date of the others that you care about?—Yes.

The witness withdrew.

*Col. H. Tidy.*

Colonel THOMAS HOLMES TIDY, Unatt. (*Assistant Adjutant General*), examined.

615. (*Chairman.*) This is, I believe, the first time you have made any application?—Yes.

616. You have expressed a wish to be examined before this Commission, have you not?—I merely felt it my duty to say a few words in defence of my position.

617. Will you point out where you stand on the list?—I am a lieutenant-colonel of March 1854, and now stand as colonel of November 1854.

618. (*Gen. Sir G. Brown.*) You were only eight or nine months a lieutenant-colonel, were you?—I was a very short time a lieutenant-colonel according to the warrant of 1854, and the gazette of 1858. I merely pin my faith upon these two clauses of the warrant, the 13th and 14th, "That field officers commissioned as such before the 20th June 1854" (I was one of those) "be allowed to rise by brevet;" it appears to me that I did rise by special favour of the Queen, upon the recommendation of certain Commissioners by brevet to the rank of colonel in 1854; I claim therefore to be allowed to stay there, that is all I claim. The Queen's aides-de-camp are Queen's aides-de-camp of 1855.

619. Do you consider it necessary to constitute a brevet that 100 men should be promoted at a time; do not two men constitute a brevet as much as 200; if you were promoted alone, it would be still a brevet, would it not?—I look upon the brevet of 1858 as a special brevet.

620. That you should be all promoted together?—Yes.

621. It has been very usually the custom for lieutenant-colonels up to a certain date to be included in a general brevet as colonels, but there is no necessity for that. Occasionally you see in the gazette a brevet, "lieutenant-colonel so-and-so to be "colonel," or "captain so-and-so to be major," any one of those constitute a brevet, but not a general

brevet; by "brevet" the clause means receiving brevet rank, does it not?—Yes, I only mean that that gazette having been issued, and I having been in my present position for nearly five years, I have some claim not to be superseded now.

622. (*Mr. Bouverie.*) This gives you a vested right, in your opinion, and you stand upon that?—Yes, I think so. I was a lieutenant-colonel before June 1854.

623. (*Chairman.*) Your interests were recommended to be protected?—I think so. I see in a list upon the table it is stated that those officers who are printed in italics are the only complainers. Now I never complained of anything; I never should have made my appearance here but that I thought it my duty to do so. This memorandum says that I am one of those who were passed over under the three years' clause; I am not one of those who were passed over under the three years' clause, nor am I a complainant.

624. Then that paper is not correct in that respect?—It is incorrect, so far as I am concerned, because I never was a complainant.

625. Were you passed over?—I was not passed over. I became a full colonel after serving three years as deputy adjutant-general. I am stated here as being one of those passed over, and also as being a complainant, but I should have become a colonel in the natural order of things in 1857, and so I was before the gazette of 1858 appeared, which by the Queen's grace made me a colonel of 1854; that is now nearly five years ago.

626. That replaced you in exactly the same position as the other lieutenant-colonels of June 1854?—Yes, with this exception, that some gentlemen who had been sitting quietly still in the meantime have gone over our heads. There are in this list majors who retired from the service; they were brevet lieutenant-colonels, it is true, but they retired from the service ten years ago, and then I found them by the *bouleversement*, which took place in 1858, placed over my head in that Gazette.

627. They were senior to you in 1854?—In 1854 they were on the half-pay list senior to me.

628. They were senior to you in the *Army List*?—Yes. I passed over their heads by the operation of the warrant, which said that three years' service was the only way in which you were for the future to obtain the rank of colonel; in fact, that nobody else was to be promoted unless they qualified for the rank.

The witness withdrew.

Colonel William Robert Nedham, (*Commanding R. Art., Sheerness*), examined.



629. (*Chairman.*) You wish to be examined before this Commission, and to make a statement, I believe?—Yes. I will read a letter which I have General Forster's permission to lay before the Commission: "Sheerness, 16th May 1863. Sir,—I have the honour "to submit the following statement for the considera- "tion of his Royal Highness the field marshal "commanding in chief. Her Majesty's Royal Com- "missioners have been directed to inquire into the "position of the distinguished-service colonels pro- "moted to that rank in the years 1855 and 1856. "Should the list of colonels be recommended for "alteration by Her Majesty's Royal Commissioners, "I consider that my interests would be considerably "affected; I have therefore the honour to request "that you will be so good as to submit the statement "to the field marshal commanding in chief, with a "view to its being submitted to the Royal Commis- "sioners, should his Royal Highness approve of the "same. Any alteration of the list of colonels of the "28th November 1854, as regulated by the Royal "warrant of October 1858, in paragraphs 13 and 14, "by the antedating of the commissions of the colo- "nels promoted for distinguished service in the years "1855 and 1856, would affect my interests very con- "siderably, for the following reasons: having become "a lieutenant-colonel on the 14th February 1854, "I, along with many other lieutenant-colonels, were "either promoted to the rank of colonel, with the "date of 28th November 1854, or antedated to that day "by the effect of Her Majesty's Royal warrant of Oc- "tober, 1858, which was deemed necessary, on ac- "count of the warrant of October, 1854, not having "taken cognizance of the claims of the officers who "had become lieutenant-colonels before the 20th "June, 1854, on which day, a brevet was announced "with the understanding that the officers promoted "on that day, or afterwards, were to be guided in "their future promotion by a royal warrant which "would soon appear, and which was promulgated in "the following October. The rectifying royal war- "rant of October 1858 placed the colonels who (as "lieutenant-colonels) were not subject to the royal "warrant of October 1854 in their proper seniority; "that is to say, the colonels who had become "lieutenant-colonels before the 20th June 1854. "The colonels of 1855 and 1856, promoted for dis- "tinguished service, I presume wish to be placed "as colonels in the year 1854; manifestly they cannot "claim the foot of that list, as they would gain no "advantage by it. I can only, therefore, suppose that "they claim to be placed in the year 1854, at least, "before the colonels who bear the date of the 28th "November of that year, and who had previously "become lieutenant-colonels before the operation of "the royal warrant of 1854. I beg leave to submit, "with the greatest respect, that if such an event took "place, I should consider it as a great injustice to "myself; for instance"—(I did not wish to mention names because many of the officers are my friends, but I could not make my statement without mention- ing them)—"Firstly—Take the date, 28th November "1854, when I, with many other lieutenant-colonels, "(who were not subject to the royal warrant of Oc- "tober 1854,) were promoted colonels on the 28th "November 1854, Colonels Dickson, Sir David "Wood, Fitzmayer, and Lysons, were certainly "lieutenant-colonels, but they only became such on "the 20th June 1854, or afterwards, under the regu- "lations of the royal warrant of the following Octo- "ber. I claim that the officers mentioned above "should not be promoted over my head, as I was a "lieutenant-colonel, under the old system, previous "to the operation of the royal warrant of October "1854. This remark also applies to any officers who "are now colonels junior to myself in the year 1854, "and who were promoted in 1855 for distinguished "conduct. Secondly—Colonels Sir Thomas Trou- "bridge, Norcott, the Earl of Longford, and H. S. H. "Prince Edward of Saxe-Weimar, did not become "lieutenant colonels before the 12th December, 1854, "and Colonel Lake not until the 9th February, "1855; therefore, on the 28th November 1854, the "date of my being promoted a colonel, the above- "named officers were not lieutenant-colonels, but "majors only. I most respectfully object to the "above-named officers being placed in the list of "colonels before me. Thirdly, Colonels Gordon, "Chapman, and Wetherall, did not become majors "until the 12th December 1854, therefore on the "28th November 1854, the date of my being made a "colonel, the above-named officers were simply "captains in the army. In their cases I submit "most respectfully that it would be necessary to "ante-date two of each of their commissions, so that "they might be placed above me in the list of "colonels. In the case of the officers just alluded "to, in the 3rd paragraph, they claim to be made "colonels anterior to the date 28th November 1854, "when actually, at the period they claim to be "colonels, they were only captains. The officers "alluded to in the 2nd paragraph claim to be made "colonels anterior to 28th November 1854, when "they were only majors at the time, and the officers

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" mentioned in the 1st paragraph, though lieutenant-
" colonels on the 28th November 1854, were all
" promoted as such on or after the 20th June 1854,
" and therefore subject to the royal warrant of the
" October following. For all the foregoing reasons
" I should feel deeply aggrieved if any of the officers
" promoted for distinguished service in the years
" 1855 and 1856 (who were junior to me as lieuten-
" ant-colonels) were placed above me in the list of
" colonels. If the officers named in paragraphs Nos.
" 2 and 3 were antedated as colonels, to 28th
" November 1854, or before, they would be holding
" commissions as colonels at a date at which they
" were either majors or captains in the army. I feel
" much respect for the officers who received the rank
" of colonel for distinguished service in the Crimea,
" but I humbly conceive that they have no claim to
" be placed over myself, having become a lieutenant-
" colonel before the brevet of the 20th June 1854,
" and before the operation of the warrant of the fol-
" lowing October. Lieutenant-colonels promoted
" upon the old system, I conceive, have, *almost*, a
" right to be promoted by seniority to be colonels,
" as acknowledged in paragraphs 13 and 14 of Her
" Majesty's warrant of October 1858. In conclusion,
" I most respectfully submit, that the colonels pro-
" moted for distinguished service (now junior to
" myself), have no claim to be placed over me.
" Firstly, because I became a lieutenant-colonel be-
" fore the 20th June, 1854; secondly, because at the
" period I became a colonel, some of the colonels of 1855
" and 1856, promoted for distinguished service, were
" not only not lieutenant-colonels but either majors
" or captains, and those who were lieutenant-colonels
" on the 28th November, 1854, junior to myself, have
" no claim to be placed before me, as I became a
" lieutenant-colonel before the 20th June 1854."

630. Have you anything to add to that statement?—Nothing, except that I omitted to mention the mode of promotion from the rank of lieutenant-colonel to that of colonel, by Her Majesty, antecedently to the 20th June 1854.

631. Before the 20th June 1854 you always considered yourself liable to be superseded by officers appointed aides-de-camp to Her Majesty?—Only in the case of the Queen's aides-de-camp, and in the case you mentioned just now of lieutenant-colonels of the guards.

632. You draw a distinction between officers appointed Queen's aides-de-camp and officers promoted for distinguished service in the field?—A great distinction, because, until the 20th of June 1854, lieutenant-colonels were not promoted for distinguished service in the field, except by being made Queen's aides-de-camp.

633. You think that was a new regulation, instituted by the warrant of 1854, and that you ought not to have suffered from it?—Exactly. I think I did not state that I became a lieutenant-colonel in February 1854.

634. (*Gen. Sir G. Brown.*) You were a lieutenant-colonel for only 9 or 10 months, were you not?—From February till November. I did not expect the promotion, of course, but it was produced by the rectifying warrant of 1858, in order to put us in our proper places.

635. (*Mr. Bouverie.*) Had you become a colonel by three years' service in the meantime?—No; I had some leave at that time. The order with reference to leave was not promulgated to the Royal Artillery, which was under the Ordnance Office at that period; however, I became a full colonel in November or December 1857. I lost some months by my leave.

636. (*Gen. Sir G. Brown.*) If, instead of recommending you to be promoted altogether in 1854, they had required you to serve three years from the date of your lieutenant-colonelcy, you would not have considered it a hardship, should you?—I should not have considered it a hardship to be a colonel in three years after I became a lieutenant-colonel, but I should have considered it a very great hardship to be put down in the list of lieutenant-colonels according to my original seniority by the warrant of 1858.

637. You were a lieutenant-colonel of 1854, I think?—Yes.

638. Without reference to anything that has passed, supposing the Commission in 1858 had proposed to make you a full colonel of 1857, dating your commission back to three years from the date of your lieutenant-colonelcy, you would have been satisfied, would not you, and have considered it a great boon?—If it did not displace me in my seniority.

639. It would not have affected your seniority, would it?—Yes, it would.

640. (*Chairman.*) You would not have been satisfied with a position, in which junior officers had been placed over your head, who were not placed over your head when you were appointed a lieutenant-colonel in 1854?—Exactly.

641. (*Gen. Sir G. Brown*) Would you have questioned anything about Queen's aides-de-camp and distinguished-service colonels or anybody else, provided you had got the rank of colonel between 1854 and 1857. Will you just consider what you would have thought at that time?—Naturally any lieutenant-colonel, if he is told "You shall be made a full " colonel in three years," would be very well satisfied. I did not wish to be made a colonel in six months, but we were made colonels, some in six months, some in a year, and some in two years, in order to replace us in our seniority. When I became a lieutenant-colonel it was a strict promotion to colonel, with the exception of the promotion of the Queen's aides-de-camp and certain ranks in the guards.

642. Supposing this Commission of 1858, instead of proposing that you and others similarly situated should become colonels of 1854, had proposed that you should become colonels in 1857, that is, three years after the date of your lieutenant-colonelcy, that would not have altered your relative positions at all, and you would have been very well pleased, would you not?—I should have been satisfied with a colonelcy in three years, provided my relative position was not altered.

643. (*Chairman.*) You distinctly answer that you would have considered it no hardship, provided your position had been maintained?—Yes.

644. (*Maj.-Gen. Sir W. Brereton.*) If you had been aware that at that moment there were full colonels of the date of 1855 who had been placed in the *Army List* as full colonels, while you were a lieutenant-colonel, then would you have been content to wait for three years for your colonelcy?—I should have been very happy to remain three years a lieutenant-colonel if I retained my seniority.

645. (*Chairman.*) In point of fact it did not matter to you whether you remained three days or three years a lieutenant-colonel provided you retained your relative position?—Exactly. Having been a lieutenant-colonel before the 20th of June 1854, I had expected, from its being a strictly seniority list at that period, that no junior lieutenant-colonel could be made a colonel over his seniors except by being made a Queen's aide-de-camp or a lieutenant-colonel of the Life Guards.

646. Your having been made a lieutenant-colonel within three years was no advantage to you whatever?—No, the advantage was to keep my position in the list.

647. (*Maj.-Gen. Russell.*) Do you know of any other mode by which your position could have been kept in the list, save that which was adopted by antedating your commission to the 28th of November 1854?—I can conceive no other mode; it was merely re-making the list.

648. (*Maj.-Gen. Sir W. Brereton.*) Preserving your rotation?—Preserving my rotation as I stood before.

The witness withdrew.

Adjourned.

## At the War Office, Pall Mall, Tuesday, 19th May 1863.

PRESENT:

Lieut.-Gen. Right Hon. J. PEEL.
Right Hon. E. P. BOUVERIE.
Gen. Ⓦ Sir ALEXANDER WOODFORD, G.C.B., G.C.M.G.
Gen. Right Hon. Sir GEORGE BROWN, G.C.B., K.H.
Lieut.-Gen. Right Hon. the EARL OF ROSSLYN.
Maj.-Gen. Ⓦ Sir WILLIAM BRERETON, K.C.B., K.H.
Maj.-Gen. HEN. SANDHAM.
Maj.-Gen. DAVID RUSSELL, C.B.
Maj.-Gen. RANDAL RUMLEY.

LIEUT.-GEN. RIGHT HON. J. PEEL, IN THE CHAIR.

Major-General HENRY EYRE (*Commanding the Forces at Chatham*), examined.

*Maj.-Gen. H. Eyre.*

19 May 1863.

649. (*Chairman.*) You were a member of the Royal Commission of 1858 I believe?—I was.

650. It has been stated by one or two witnesses, who have given evidence before us, that the cases of the officers, whose claims are now under consideration, the Queen's aides-de-camp and the officers promoted for distinguished conduct in the field, had been overlooked by that Commission, and that the attention of the Royal Commission had not been drawn to their case; can you, as a member of that Commission, give us any information as to whether or not their case was considered by that Commission?—I left home without being aware of what branch of the subject was likely to be brought before me, but I sufficiently remember our proceedings to be able to answer that question; in fact there is no part of our proceedings which I remember better than that, because it has been kept in my recollection by being brought before the public by General Lindsay and the officers who raised the question, which question is a very important one certainly. The impression they are under has always surprised me, because nothing can be more erroneous than that impression. There is nothing that I more distinctly remember than our Commission discussing the merits, not only of all classes, but especially of these classes. Perhaps the most important meeting we had was on the 18th April 1858, when General Lindsay was examined, and I think there can be no better answer to his statement than his own evidence on that occasion, which I beg to submit to the notice of this Commission, and especially the questions and answers 61, 62, 63, 64, 74, 75, 76, 77, 83, 96, and 98, but in other parts also. It is clear that these classes of officers were considered.

pendix, es 63, 64.

651. (*Gen. Sir A. Woodford.*) Do you mean the distinguished service officers?—Yes; I cannot quite call to mind whether names were mentioned, although I even think names were quoted. However, that I will not be certain about. All I mean to assert is, that the two *classes* of officers mentioned were considered. I cannot say that any *individuals* were specially considered. I assure this Commission that I can positively say that we, most advisedly, with our eyes open, proposed the measure which we did propose; what we felt was that it was necessary. I recollect, as well as possible, great stress being laid on the term "vested interests," which was perpetually at that time, as everybody in the service knows, thrown in the teeth of the Government, and we all felt that it was a thing to put a stop to at once and for ever. We knew that some of the lieutenant-colonels had no special claim to consideration under ordinary circumstances, nevertheless we thought it necessary to include them, however great their luck, and to do something so sweeping that it would shut up this vested interest question. And, as I say, we talked a great deal about this measure, and we considered it the most effectual and the only one to be adopted. I was called upon to act with General Yorke on the Committee subsequently; we went very fully into the subject, and there was a letter to the Military Secretary, which, if it has not been before the Commission, I consider well worth their notice, because I consider that letter unanswerable.

652. (*Mr. Bouverie.*) Was that the letter written by the direction of the Commander-in-Chief, dated the 26th of September 1859?—Yes. As I say, it will be seen in General Lindsay's own evidence, independently of our discussion on the interests of all classes, that he did not allow us to overlook those classes. I speak of classes, not of any particular officers. We thought that many officers, although they had no special claim to promotion for service, had yet laid out money under the old rule, and had arrived at a stage when they looked forward to getting their general's rank without supercession, and had probably lost the opportunity of a good market at some time or other for realizing under this expectation. Therefore this new rule evidently most seriously affected them; that was the vested interest which we bore in mind, and if we had provided for only some of them who were perhaps more distinguished than the others, we should have left those officers always liable to bring forward a similar claim.

653. (*Gen. Sir G. Brown.*) Would you not have satisfied the expectations of all those officers if you had given them the rank of colonel at the termination of three years' service?—We should have abandoned the principle on which we wanted to act, by that measure.

654. (*Maj.-Gen. Russell.*) The object was to do away for ever with vested rights?—Quite so. The fact is, we considered that the brevet of June 1854 might have been a more extended one, and might have included all those officers, and our recommendation virtually made it so, and therefore I maintain that those officers were, in the year 1854, colonels, and, being colonels, nobody could go over their heads, whether he were a Queen's aide-de-camp or a distinguished-service colonel or not.

655. (*Gen. Sir G. Brown.*) The Queen's aides-de-camp have been always accustomed to go over their heads, have they not?—Not over the heads of colonels; they could not have passed over those officers if they had been made colonels.

656. (*Maj.-Gen. Sir W. Brereton.*) At all events, you are of opinion that the cases of those officers were brought before you?—Certainly these *classes* of officers. I was greatly astonished to hear that it had been stated otherwise.

657. (*Mr. Bouverie.*) It is not correct, then, to suppose that these officers have been overlooked, or that the Royal Commission forgot all about them?—It is most erroneous, but I wish to guard myself from saying that we discussed any of these particular officers; I speak of such classes.

658. (*Maj.-Gen. Sir W. Brereton.*) Is not it the case that the whole proceedings of the Royal Commission of 1858 were printed and circulated amongst the members of the Commission, but only a part of those proceedings was afterwards published to the world?—I think there is a little misconception in that respect. We determined, at starting, to take no evidence except documentary evidence, such as letters that were addressed to us; but we made an exception in General Lindsay's case, because he had started this question. He was the cause of the inquiry, as well as my memory serves me. I have not thought

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it over, but I am tolerably certain that I am right in what I say; we did not think it necessary to embody in our report that solitary evidence, although we printed and published it separately.

659. When you say "printed and published," let me ask, it does not appear in the Blue Book, does it?—No, it was not in our report; I have a copy.

660. All that you have said is authenticated in that printed document?—I consider it is. The Commission will be able to judge.

The witness withdrew.

*Maj.-Gen. J. Walpole.*

Major-General JOHN WALPOLE, R. Eng., examined.

661. (*Chairman.*) I believe you have been made acquainted with the object for which this Royal Commission has been appointed, namely, to inquire into the cases of certain officers, Her Majesty's aides-de-camp, and those who have been appointed for distinguished service in the field, and who have made an application to have their cases reconsidered; you have expressed a wish to be examined before this Commission?—I have no objection. I do not know that I have anything more to say than what I have embodied in this paper. I will read my statement:—"To Lieutenant-General the Right Honourable J. Peel, and the general officers appointed as Commissioners to inquire into the claims of certain officers promoted in 1855 to the rank of colonel, &c., United Service Club, 14th May 1863. Gentlemen,—Independent of the representations which will be made to you by the officers who received the rank of colonel for their services in the Crimea in 1855 to have their positions improved, either by the antedating of their commissions, or by having their places advanced in the *Army List*, I cannot but anticipate that separate and specific claims will be set forth by Colonels John Gordon, C.B., and Frederick Chapman, C.B. of the corps of Royal engineers, to have their cases separately considered, with a view to their superseding me in my position of major-general in the corps; because they deem an injustice has been done to them by my promotion to the rank of colonel dated the 28th November 1854, by virtue of the warrant of 1858, and whereby I have attained to my present rank. It may be remembered that on the 27th March last Major-General Lindsay in the House of Commons asked the late Secretary of State for War to move the Queen to *suspend the promotion* in the corps of Royal Engineers, occasioned by the death of Major-General Alexander Gordon, until the matters which have now been submitted to your consideration had undergone investigation. I was the officer to succeed to this vacancy, and it appeared to me a most unusual step to request a succession to be set aside, which, according to the rules of the service, and under the authority of a Queen's warrant, I was entitled to enjoy. On this occasion the late Sir George C. Lewis replied that Her Majesty's Government felt they were not justified in acceding to the proposition of the major-general, a declaration which, I beg permission to say, received the fullest support of Field Marshal His Royal Highness the Duke of Cambridge. I have, therefore, a firm confidence that in your deliberations I may receive full justice at your hands. I can make no claim to any brilliant service, yet I desire humbly to urge a long and faithful one of 45 years (many of which have been passed abroad) as some claim for consideration. In Canada I served about seven years, in Jamaica nearly three years, at the Cape of Good Hope seven years, and a short time at Gibraltar, which would have been extended to a longer period had I not been recalled to fulfil the duties of commanding engineer at Woolwich. My first commission was dated 1st August, 1816, and I did not become a captain till November 1839, having been upwards of 23 years a subaltern; on the 15th September 1848, I obtained the rank of brevet-major, for services at the Cape of Good Hope during the Kaffir insurrection of 1846–47, when I was, on the 8th of June 1846, twice wounded. On the 17th February 1854, I became a lieutenant-colonel in the corps, and by the warrant of 1858 was promoted to colonel with several other ordnance officers, our commissions bearing date 28th November 1854. Colonels Gordon and Chapman have not respectively more than 30 and 28 years of service against mine of 45, exclusive of one year and three-quarters on half pay, arising from the reduction of the army in 1819; and when I was a lieutenant-colonel in the corps, they were only captains; to be therefore superseded by officers so much my juniors would be truly galling, and extremely prejudicial to my interests; for I would beg to call attention to the circumstance that in my case the effect may be more damaging than in that of other corps, where the consequence will be only the difference in the standing in the *Army List*; whereas in my case the privilege of succeeding to a commandantship would be retarded by two officers who did not enter the army till 17 and 19 years after I did. Respectfully submitting this statement with the fullest confidence that my case will be fairly and justly considered;

"I have the honour to be, gentlemen,

"Your most obedient and humble servant,

"JOHN WALPOLE,

"Major-General, Royal Engineers."

662. Have you anything to add to the statement you have just read?—I wish to add a few remarks. The Commission are probably not unacquainted with the dates of Colonel Gordon's and Chapman's commissions as field officers. From their almost unprecedented promotion one would imagine they would be satisfied with their present position. Colonel Gordon became a Major on the 12th of December 1854, a lieutenant-colonel on the 24th April 1855, and a colonel on the 29th of June following, having acquired that rank in 6 months 19 days. Colonel Chapman was made major on the 12th of December 1854, a a lieutenant-colonel on the 24th of April 1855, and colonel on the 2d of November 1855, attaining to that step in 10 months and 21 days. This rapid promotion has placed these officers in so favourable a position that, in succeeding to the rank of major-general, even in the regular course of corps promotion, they will, in all probability, arrive at that rank with only a total service of 34 years. Very few major-generals, I believe, have been so fortunate as to attain to that rank in that time. I may mention that I feel myself warranted in making these observations, when a public paper has been promulgated showing the places where the officers are to stand, putting Colonels Gordon and Chapman before General Stehelin and myself.

Appendix, page 53.

663. Are you aware that, what you call a public paper, is merely a paper issued by a private individual, showing what the effect would be if his recommendations were carried into effect?—However, in a public letter addressed by Colonel Gordon from Canada last year to the Secretary of State for War, he alludes to the circumstance of a vacancy having occurred to which Major-General Stehelin succeeded, and to which he considered he himself ought to have succeeded; that is a public document.

Colonel Dudley W. Carleton, Coldstream Guards, examined.

*Col. D.W. Carleton.*

19 May 1863.

664. (*Chairman.*) You have probably seen a copy of the Commission which has been issued by Her Majesty?—No.

665. I will read that portion of it which relates to yourself. "Whereas it has also been represented to "us that certain Captains and Lieutenant-Colonels "of the Guards who were promoted to that rank "between the 20th June 1854 and the issuing of the "warrant of 6th October of that year, consider that "their positions in the army have been unduly in- "injured by the operation of the said warrant of 6th "October 1854, and also by the subsequent warrant "of 14th October 1858." Then it goes on to say— "We do hereby authorise and empower you our said "Commisssioners, or any three or more of you to ob- "tain information thereupon, by the examination of "all persons most competent by reason of their know- "ledge, habits, or experience to afford it; and also "by calling for all documents, papers, or records "which may appear to you, or any three or more of "you, calculated to assist your researches, and to pro- "mote the formation of a sound judgment on the "subject. And we do hereby command and require "you, or any three or more of you, to report to us, "under your hands and seals, with all convenient "speed, your opinion whether these officers are en- "titled to any redress, and if so, to recommend in "what form such redress should be accorded to "them." I understand that in consequence of this Commission being appointed you wish to state your case, will you state it?—I was promoted to a company of the guards with the rank of lieutenant-colonel after 15 years' service, on the 15th July 1854. I went out to the Crimea in the month of September, and I remained there for 13 months. I did not come home till October 1855. I had no means of hearing that a warrant was likely to come out when I was promoted to that rank, or of coming before the Commission that inquired into the case. I found myself, in the month of January 1862, superseded by 165 officers, of whom 14 were junior to me, in every rank in the service; the captains of the guards that were in the Crimea obtained no brevet rank, as it was, I believe, considered that their rank of lieutenant-colonel was a reason for not giving them any brevet rank. I conceive that if I had been a captain in the line I should have got a brevet step for the battle of Inkermann, and another brevet step if I had been senior captain of my regiment, which I was in the latter part of the campaign, after Inkerman; and then I believe I should have been qualified, by being promoted for distinguished service in the field as the term is, to succeed in due course to the rank of colonel. I applied immediately on my return, to Lord Rokeby and some other officers connected with the Royal Commissioners, and I applied to the Commander-in-Chief on the 12th of November 1860 for redress. I was told when I came home that so many of the clauses of the warrant of 1854 had given dissatisfaction that another commission was about to be issued, and that alone prevented me from making more stir. I was in hopes that, in the Commision of 1858, my case would have been considered, or that I should have had a hearing. The Commission called upon General Lindsay in 1858 and were satisfied with his evidence. I was in communication with General Lindsay about that time, and I have here, in General Lindsay's own handwriting, a memorandum that I should escape that wholesale supercession. I have a letter from General Lindsay dated 17th November 1858; it is a memorandum which is applicable to my case. When I talk in the first person singular I am giving the case of others. I hope you will not think that I am stating my own case only, but that of all those in the same category. General Lindsay wrote me this memorandum in his own handwriting, saying that I should escape that wholesale surpercession; he was in constant communication with the members of the Commission at that time. He says in his note: "37 "lieutenant-colonels have been promoted to the rank "of colonel, by which you now stand 34th on the list "for promotion by succession, and will consequently "escape that wholesale supercession which you must "otherwise have undergone." That is from General Lindsay, whose evidence was taken before the Commission of 1858.

666. He was not a member of the Commission?—No, he was not, but his evidence was taken.

667. (*Maj.-Gen. Rumley.*) What is the date of that letter?—7th November 1858; it was evidently written under a misapprehension.

668. (*Gen. Sir Alex. Woodford.*) I see in a letter to the under Secretary of State for War dated the 29th of April 1861, you say "Already have I been "passed over by a subaltern of 1854, also by "lieutenants and captains in the guards, by the effect "of a retrospective warrant?—Yes.

669. Will you explain that statement?—I was passed over in this way: unfortunately the *Army List* which refers to this is locked up at Windsor and I was not able to go down and fetch it in consequence of having had a notice to see the Commander-in-Chief yesterday. I have got it marked; however I could point it out with the annual *Hart's Army List* Colonel Honble. Leicester Curzon is the individal to whom I allude. When I was lieutenant-colonel he was a lieutenant upon the Commander-in-Chief's staff, Colonel Henry Ponsonby and Colonel Lord Arthur Hay, now Lord Walden.

670. You say by a subaltern of 1854, who was that?—That is Colonel Leicester Curzon.

671. (*Maj.-Gen Russell.*) You say by a "retrospective warrant," will you explain that?—I was a lieutenant-colonel of 14th July 1854, quite ignorant of what the proceedings of the Commissioners were likely to be, and the warrant of 1854 is dated the 6th of October.

672. (*Gen. Sir Alex. Woodford.*) How many officers do you suppose have gone over your head?—About 250, I think; there were 165 on 1st January 1862, and then in the year 1862 there were, I think, about another 100.

673. (*Chairman.*) Do you represent Colonel Hepburn in this examination?—I represent the case of Colonel Hepburn, Colonel Bruce, and Lieut-Colonel Charteris. Colonel Charteris is out of the guards; I do not know whether his case is to be considered in the same category or not. Colonel Hepburn is out of town; I have sent to Col. Stephenson, but I have not been able to communicate with him since I have received the summons. Colonel Stephenson, I conceive, is one of the officers; all those officers will be affected in the same way, although they have obtained their promotion from various causes. Colonel Stephenson's, I conceive, is one of the hardest cases. I may mention, also Colonel Wynyard; they have not been superseded by as many officers as I have.

674. Colonel Stephenson got his promotion for service in China, did he not?—Yes; still I stand 165 lower down; of those, 72 were above Colonel Airey, who was the first officer that went over my head in that "wholesale supercession," to use General Lindsay's term. There were others, from various causes, about 95 in number, who have got over Colonel Winyard's head, and about 120 over Colonel Stephenson's head.

675. Did you qualify as a mounted officer?—I acted as major in command of my battalion during a short part of the time in the Crimea, but I did not qualify as a mounted officer. I should not have applied if I had not been near my time, on account of that period, during a few months in the Crimea, when I was acting as a mounted officer; in fact, during the whole of the winter of 1854 I was second in command. It has been said that I began life in the 60th regiment, and if I had been in the 60th I should

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have received the rank that I had during the time I was in the guards. I have a statement on that point.

676. (*Gen. Sir G. Brown.*) Did you purchase your lieutenant-colonelcy?—No; I obtained it on the augmentation of the army.

677. You obtained it after the issue of the warrant of 1854?—No, four months previously to it, and it is upon that that I base my chief grievance, if I may use the word.

678. (*Chairman.*) I understand that what you complain of is that the operation of the warrant of 1854 should have had a retrospective effect as far as you are concerned, and that, having been one of those officers, who were appointed lieutenant-colonel between the 20th of June, and the 6th of October 1854, you ought not to have been subjected to the provisions of that warrant?—Yes, exactly.

679. On the 1st of July 1854 you were a lieutenant and captain in Her Majesty's service?—Yes.

680. On the 20th of June 1854 there were 124 majors in Her Majesty's service who were appointed lieutenant-colonels on that date, by the brevet which came out then?—Yes.

681. They were, therefore, lieutenant-colonels on the 20th of June 1854, at a period at which you were a captain?—Yes.

682. But they are all subject to the provisions of that warrant of 1854, because it was notified in the gazette which appointed them to be lieutenant-colonels that they were subject to the provisions of any new warrant which might be issued?—If I rightly understand it, they had the rank of major conceded to them.

683. They were the senior majors, and were made lieutenant-colonels; it is quite evident that the operation of that warrant applied to them, because it was notified to them in the Gazette of the 20th June that they were promoted subject to the provisions of any new warrant that might come out. Was not it in consequence of that brevet of the 20th of June 1854 that you obtained a lieutenant-colonelcy; did you not obtain three steps by that brevet of 1854?—I obtained my steps by the augmentation of the army; there were eight companies, and they were increased to 10.

684. You had become senior captain and lieutenant-colonel?—It is a question I should not like to answer at random. I know there was a step.

685. If it had not been for that Gazette of 1854, you would not have obtained your promotion probably previously to the 6th of October, would you?—I think I probably should, because Colonel Trevelyan and Colonel Boyle died at Varna, and I think that would have given me my step.

686. Was that previously to October?—Yes. I was sent out at 48 hours' notice in consequence of Colonel Boyle's death.

687. It is perfectly evident, is it not, that all those officers, who were lieutenant-colonels on the 20th of June, before you had obtained a lieutenant-colonelcy, were subject to the provisions of this warrant?—They were brevet lieutenant-colonels, which was an advantage to them, whereas I had 15 years' service.

688. The report of the Royal Commission had been published previously to your promotion, had it not?—I think not, but I cannot tell.

689. The brevet of the 20th of June must have taken place previously to your promotion?—Yes; certainly.

690. The case of the officers of the guards was exactly similar to the case of any officers who were promoted to the rank of lieutenant-colonel previously to the issue of the warrant of 1854?—Would their case not be that, having arrived at the top of their respective rank regimentally, and by slow succession in time of peace, at the outbreak of the war, they had no alternative, so to say, save to go on serving, and they were bound to accept what was given them as a boon, although it was very disadvantageous to them?

691. I do not speak of those officers who were appointed by the brevet, but I speak of those officers who, in the regular course of promotion in the line, got their promotion as lieutenant-colonels previously to the issue of the warrant of the 6th of October 1854, they would have just as good a right to claim exemption from the provisions of that warrant as the officers of the guards?—I am not sure that I can quite follow you in that.

692. I understand you, on your own part, and on the part of the other officers of the Guards, to claim exemption from the application of that warrant of 1854 because you were appointed lieutenant-colonel previously to its coming out?—Yes.

693. Would not any other officers who had been appointed lieutenant-colonels previously to its coming out, whether in the regular course of promotion or otherwise, have an equal right to claim exemption from being superseded?—When they arrived at the top of the list.

694. I do not understand that your position refers to your being at the top or the bottom of the list; you were appointed a lieutenant-colonel before this warrant came out, but subsequently to the appearance in the Gazette of the announcement that the officers then promoted would be subject to a future warrant?—But they had no alternative but that of declining their promotion. I submit that if I could have declined that promotion I have a right with 15 years' service to assume that I should have been the senior captain of a regiment of the line, and in that case I should have been better off than with that lieutenant-colonelcy which I was forced to accept with those conditions.

695. You have stated that under the new regulations it would be impossible for you to become a colonel before 1865. I am happy to think that you were greatly disappointed in that, and that in 1862 you did become a colonel in Her Majesty's service?—I became a colonel because Her Majesty has not yet, I believe, enforced the provisions as regards the majors of the Guards. I became a colonel in consequence of my succeeding to a majority in the Guards. I had been at the top of the list of lieutenant-colonels ever since the 20th December 1859; that is three years for which I was at the top of the list, treading water.

696. But having attained the rank of Colonel by becoming a major in the Guards, how many lieutenant-colonels did you pass over by that appointment?—I do not think I passed over any at all. I had been a senior lieutenant-colonel of the army for three years.

697. Then you obtained no advantage?—I obtained a very great disadvantage.

698. Not by becoming a colonel?—No, not by becoming a colonel. I was at the top of the list.

699. Then your answer to my question is, that you passed over nobody's head?—I passed over nobody's head. I do not know whether there are one or two of those lieutenant-colonels who were not on service. I had been during three years at the top of the list. I passed over the heads of Colonels Charteris and Hepburn, they were in exactly the same category as myself also some of those half-pay captains who were quite at the top of the list.

700. You did obtain an advantage by that peculiar regulation which applies to the Household Troops?—I passed over the heads of two officers, Colonel Charteris and Colonel Hepburn, who are guardsmen. With respect to the others, if I understand the provisions of these warrants rightly, which I am not at all sure that I do, those half-pay captains being lieutenant-colonels can only succeed, I believe, to colonelcies when a vacancy is created by an officer in a similar position.

701. If your appointment to the rank of lieutenant-colonel had been subsequently to the 6th of October 1854, you would naturally have been subject to the provisions of the warrant of 1854?—Yes, and to any law that was in existence before I succeeded.

702. Do you not consider that the notification of the Gazette of the 20th of June 1854, rendered you subject to the warrant of October the 6th?—No, indeed, I do not, for I see so many notifications in the Gazettes that are made null and void within a year or so.

703. Until it was made null and void was not that notification binding?—Do you consider that that was sufficient when you had what you may call a vested interest after 15 years' service?

704. The vested interest did not arise until you became a lieutenant-colonel, and if in the Gazette it appeared that all subsequent promotions were to be subject to a warrant which was to come out hereafter surely your rank was subject to that provision?—I had not the option.

705. Nor had any of those officers who were promoted then; it might have been an advantage to them to remain senior majors?—As senior majors they might have retained their position as regimental majors, it could hardly have been better for them I think. I am exhibiting how it would have been better for my special case; I should have had two steps by brevet majority, and I should have qualified for promotion by what is called distinguished service in the field.

706. As I understand, you would not have been, or, at all events, it is probable that you might not have been, a lieutenant-colonel at all, previously to the 6th of October 1854, if it had not been for the promotion which you obtained by the brevet which took place in consequence of the recommendation of the Royal Commission of 1854?—I think I must have been. I am not in a position to answer that positively. I think that I certainly should have been by the augmentation of the army that was required by the exigencies of the war service.

707. It was to such new appointments that the warrant was intended to apply, was it not?—Pardon me, I think if the brevet had not existed, I should have obtained the rank. I think the brevet took two men, and those two men would have been covered by the death vacancies to which I allude; this is put as a hypothetical case. I see I passed over a cornet of 1795.

708. It appears that the Royal Commissioners who sat in 1854 recommended in their report that all the existing interests should be protected, and that in order to protect them a general brevet should take place; and it is quite evident that their intention was that their recommendation should have effect with regard to all future and prospective appointments; you suffered from an altered position altogether with regard to the Guards officers. I think a new disqualification, as I might almost call it, as regards the Guards officers was introduced by the warrant of 1854, was it not?—Yes.

709. Placing them in a worse position than they had been in before?—Yes, inasmuch as no qualification was required before the warrant of 1854, but that required three years and the warrant of 1858 five years service.

710. Previously to the warrant of 1854 the Guards rose to their natural position that they took in the *Army List* as lieutenant-colonels, did they not?—Yes.

711. I think we clearly understand that what you state is this, that having been appointed a lieutenant-colonel previously to the issue of the warrant of 1854, you claim that you ought not to have been subject to it?—That I should not have been subject with the other officers to this disadvantage. I submit that my grievance, if I may use the word, is supported by looking back to what the effect of it has been. I am passed over without any good cause by, I believe, 250 officers. I could count them up in a very short time, and send in their number. There were a great number who were on service. That circumstance effectually debars me from that prospect which I considered during my first 16 years of service I had some right to look forward to.

712. Supposing you had only been appointed a lieutenant-colonel subsequent to the 6th of October 1854, you would have been still superseded?—I should still have been superseded, but the law would have been promulgated at the time of my commission, that warrant would have been in force and would have been before the public, whereas I venture to say there were not three regimental officers in the army who knew what that warrant was of October 1854.

713. Did they not know that they were subject to it, whatever it might be?—No, it had been so stated in the Gazette, it was held out to them that some enactment of the kind was to come out, but what it was likely to be they were not in a position to judge when they went out on service.

714. What was the general effect of the warrant of 1854 on the officers of the Guards, leaving out of consideration your own case?—The general effect was disadvantageous.

715. Are they continually passed over now?—Continually, there was a batch of lieutenant-colonels promoted the other day.

716. Is not there in the report of Sir Charles Yorke's committee something which refers to that subject?—I believe there is.

717. In the 102nd paragraph of the commission of 1858 it is stated, that "If experience shall show that "this inequality in the promotion of the Guards and "Line is permanent or increasing, and that in that "respect the intentions of the commission of 1854 "have not been fulfilled, the military authorities in "that case would in our opinion be justified in taking "such measures as may remove that inequality with-"out sacrificing the principle of exacting a qualifying "service in one rank before attaining another"?—Yes.

718. That was a recommendation. I believe Sir Charles Yorke's Committee referred to that recommendation of 1858?—Yes.

719. Do you consider that the inequality on account of the three years rule is increasing?—I think it is not increasing, because I think it is counterbalanced by the rapidity of promotion in the Guards, but I think that it has acted very prejudicially upon officers of about my own standing. I think the Commissioners will see, if they look at the *Army Lists* of 1854 and 1858, the very great difference that exists in the standing of officers who were subalterns; they will see that a great number of officers have left the Guards about that period.

720. (*Gen. Sir A. Woodford.*) At page 5 of the report of the Committee of 1861, I find these words: "It appears that of all the officers promoted "to be lieutenant-colonels on the 20th June 1854, "and between that date and the issuing of the war-"rant of the 6th October of that year, none but the "following officers of the Foot Guards remain in "that rank, the last officer of the line (Colonel "Halliday, 36th Regiment) having been promoted "on the 13th December 1859," and you were promoted in 1862?—Yes, on the 26th of December 1862, antedated to 9th November.

721. Colonel Hepburn was appointed brevet colonel on the 2nd of February 1863, having served his five years as a mounted officer?—Yes.

The witness withdrew.

*Maj. Marvin.*

May 1863.

Major William Marvin, (*War Office*), examined.

722. (*Chairman.*) I think you were in that position in the War Office in the year 1858, if not in 1854, in which the question of drawing out warrants and the framing of them was referred to you?—Yes; in 1858, but not in 1854.

723. Will you state what was the practice in the army previously to the Royal warrant of 1854 with regard to the promotion from the rank of lieutenant-colonel to that of colonel?—As far as my knowledge enables me to answer the question, no officer in the cavalry or infantry could advance to the rank of colonel otherwise than by length of service under the system of periodical brevet, except by promotion as Queen's aide-de-camp.

724. And certain ranks in the guards which gave the position?—Yes, and the rank of regimental-colonel in artillery and engineers, which carried the officer up just the same as if he were a Queen's aide-de-camp.

725. Then you consider that the introduction, by the warrant of 1854, of the promotion to the rank of colonel being recommended for distinguished service, was a new arrangement?—Quite so, to the best of my knowledge.

726. As new as promotion for a certain number of years' service?—Yes, quite so.

727. You were, I think, secretary to the Royal Commission of 1858?—Yes.

728. As secretary can you give this Commission any information as to whether the cases of the lieutenant-colonels and the distinguished service officers were considered by that Royal Commission?—So far as this, that General Lindsay, who was the only witness examined, stated his view of their case, and a copy of the proceedings was sent to each member of the Commission.

729. General Lindsay was examined and in the course of his examination certain questions were put with regard to the cases of the distinguished-service officers?—Yes.

730. Therefore, so far as that goes, there can be no doubt that their cases were brought before the Commission?—Their cases were brought before the Commission by General Lindsay's evidence, which was printed, and each member had a copy of it laid before him at the following meeting, or a copy was sent to his residence. I am not sure whether on the day on which General Lindsay was examined all the members were present. I have a memorandum by which I can tell exactly the members present on that day. My memorandum says, "Present, the same "members as on the 21st, except Sir James Scarlett, "from whom a telegram was received stating that he "could not attend." Their names are also printed in the minutes of evidence.

731. Subsequently to the report of the Royal Commission of 1858 orders were issued from this department, from the Secretary of State, to prepare a warrant founded upon the report of the Commissioners?—Yes.

732. To whom would the Secretary of State give directions that the warrant should be prepared?—The Under-Secretary, or the secretary for military correspondence, who would give me instructions either verbally or in writing.

733. Can you recollect what the instructions were that you received with regard to the preparation of that warrant?—To prepare the warrant strictly in accordance with the recommendations of the Commissioners, adopting such provisions of the old warrant of 1854 as had not been altered, and introducing such new provisions as were contained in the report of the Commission. I can tick off the paragraphs of the report on which each clause of the warrant of 1858 was founded.

734. Therefore, in fact, the warrant of 1858 was prepared strictly in accordance with the report of the Royal Commission of 1858?—Most strictly so.

735. Did you prepare the warrant of 1854?—I did not. The warrant of 1854 was drawn up by Mr. Croomes. Mr. Ramsay was the secretary of the Commission. Mr. Croomes furnished a paper to some of the distinguished-service colonels (to Sir Thomas Troubridge, I believe), in which his views of the original warrant are fully expressed; of course I can only speak with certainty of what was required to be done in the preparation of the warrant of 1858, which was to adopt the provisions of the former warrant that had not been altered, and to introduce the new provisions recommended by the Royal Commission of 1858. Appendix, page 53.

736. Of course you have read the report of the Royal Commisson of 1854?—Yes.

737. In which they recommended that the existing interests should be protected?—Yes.

738. And you have also seen the warrant of 1854?—Yes, certainly.

739. In which that recommendation does not appear to have been carried out?—It does not appear to me to have been carried out as it might have been; it says in the 8th clause that officers promoted before the 20th of June 1854 shall "be allowed to rise by "brevet as under the regulations then in force," with a view, it is presumed, to protect existing interests; but the clause in question is altogether silent as to the precise mode in which this protection was to be afforded. In my view of the case a provision should have been introduced to the effect that as an officer who had completed his three years' service became a colonel, those who stood before him who had not qualified should go up with him, that is to say, all between the one promoted then and the one who had been promoted immediately before him; half-a-dozen or more might perhaps intervene; this is certainly the course I should have suggested if I had been called upon to draw up the warrant of 1854.

740. It would not have protected them from being superseded by officers promoted for distinguished service, which promotion also you stated to be something new introduced by the warrant of 1854?—The distinguished service officers must of course have superseded them, because they would not have waited to complete the three years' service.

741. Then that three years' service protection would not have been a sufficient protection from the effects of the warrant of 1854?—No, because a new principle had been introduced in the warrant of 1854 which did not exist before. The only chance of being superseded before 1854 was by a Queen's aide-de-camp.

742. Therefore what you propose would not have protected them from that?—No, not from that.

743. In point of fact it would not have been a sufficient protection against all the new clauses in the warrant of 1854?—Certainly not.

744. By the warrant of 1854 what protection was given to the existing interests of the colonels; there was a new system introduced of promotion to the rank of major-general, was not there?—Yes, for distinguished service in the field.

745. But still there was some protection given, was there not, to those who were colonels at the time?—Yes, to this extent, that the major-generals promoted to that rank for distinguished service should only be brought on to the fixed establishment in alternate vacancies, every second vacancy being filled by seniority from the list of colonels.

746. Were they not made supernumeraries?—Yes, in the first instance; but they only remained so until, as stated in my reply to the previous question, they could be brought on to the fixed establishment alternately with a senior colonel. In 1858 it was considered that they ought not to be placed on the establishment, even in alternate vacancies, but that they should be made supernumeraries, and continue so till it came to their turn for promotion in the

order in which they stood originally as colonels; as, for instance, there are three supernumerary major-generals of artillery—Sir F. Williams, Sir Richard Dacres, and Dupuis, who are waiting to be brought on to the fixed establishment of artillery general officers, according to their original relative positions as colonels in the army.

747. Then the warrant of 1858 remedied a grievance with regard to the colonels as well as the lieutenant-colonels ?—Yes, certainly.

748. The case of the colonels who were suffering in that manner was fully brought before the consideration of the Commission of 1858 ?—Yes. I understand you to be speaking with reference to the generals. That subject was clearly brought under notice, and it was considered that the number of generals was not sufficient, and hence an increase from 234 in the warrant of 1854, to 260 as allowed by the warrant of 1858; and it was thought that it would be some relief if the distinguished-service general officers, who had been promoted out of their turn, were removed from the established list in order to give promotion to the senior colonels.

749. Therefore, in fact, the country was put to an additional expense in order to rectify what had been an oversight in the warrant of 1854 ?—Yes, it was supposed by the Commission that, if the war had continued, the number of distinguished-service generals would have been so great that the promotion of the colonels, in the order of seniority, would have been seriously retarded.

750. I think I may say, having been Secretary of State in 1858, that the directions which were given were to carry out strictly the recommendations of the Royal Commission of 1858 in the form of the new warrant ?—Quite so.

751. Do you consider that that was done ?—Strictly; I challenge the comparison of every word in the report of the Commissions with the warrant founded upon that report.

752. (*Gen. Sir G. Brown.*) Did the Commissioners of 1858 make any specific regulation with reference to the officers promoted for distinguished service, or the Queen's aides-de-camp ?—The Commissioners made no allusion to them in their report.

753. They did not refer to them at all ?—There is nothing said in their report; the only statement in print is what you have seen in General Lindsay's evidence.

754. It did not occur to the Commission that in putting all lieutenant-colonels back, by giving them a retrospective promotion, they would affect the position of those distinguished colonels ?—I cannot go so far as that; there was a discussion between the different members on the subject of the distinguished-service officers, but it was not noted for insertion in the report of the Commission.

755. (*Maj.-Gen. Sir W. Brereton.*) A great deal of what passed at that Commission was never reported at all ?—Just so; there was a conversation between the Commander-in-Chief, the Chairman, and others on this, and other matters, not specifically mentioned in the report.

756. Still the subject was very amply discussed ?—Yes, as I have explained; but, it not being for insertion in the report, I did not take that interest in it which I should have done if I had had to take a note of it.

757. (*Gen. Sir G. Brown.*) It was not referred to in the recommendation of the Commission, was it ?—No; there is nothing about it in the recommendation.

758. (*Maj.-Gen. Russell.*) The point was mooted, and discussed among the members ?—Yes, it was mutually discussed among the members.

759. (*Chairman.*) If in 1854, in order to protect those officers, the whole of the then existing lieutenant-colonels had been made colonels, there would have been no hardship towards any of the distinguished service colonels or the Queen's aides-de-camp, would there ?—No; they would have come at the bottom of the list, as a matter of course.

760. That was, in fact, what the Commission of 1858 recommended should be done ?—They considered two or three different plans, which occurred to different members, and they thought the best course to adopt would be to promote every lieutenant-colonel to the rank of colonel who was a lieutenant-colonel before the 20th of June 1854.

761. And although some of those officers would have been a very short time lieutenant-colonels, if they had been promoted on the 20th of June 1854, there was no rule in the service which required a certain length of service between the ranks of lieutenant-colonel and colonel, was there ?—None, that I am aware of.

762. Had you anything to do with the preparation of the instructions in the Gazette ?—Nothing.

763. They were not submitted to you ?—No.

764. Do you consider that the notification in the Gazette which gave the brevet rank of the 20th of June 1854 would apply to all promotions subsequent to the date of that appearing in the Gazette ?—No doubt. I take it that it was the intention that every promotion that took place subsequently to that date should be regulated by it.

765. All subsequent promotions ?—Yes.

766. It would be considered a sufficient notification from this office, in your opinion ?—Yes; I should say so; it is the most public way of publishing such a notification.

767. In fact, a notification in the Gazette is the only way in which it could be done ?—Yes; everything in the way of promotion is notified in the Gazette.

768. (*Gen. Sir G. Brown.*) Did it ever occur to the Commissioners of 1858 to grant promotion to those lieutenant-colonels requiring them to complete the three years service first, in fact that the lieutenant-colonels of 1854 should be promoted after three years' service ?—It was brought before them by General Lindsay; he proposed it in one of his recommendations to the Commission. The Duke of Cambridge, following up a question from Sir H. Storks, puts this to General Lindsay : "Then will you explain "what you mean ?" General Lindsay says, "I would "take the warrant of 1854, which says that a lieu- "tenant-colonel commanding a regiment is to become "a colonel in three years, as the base of the altera- "tion. A certain number of them were promoted "on the 28th of November 1854, at which time "a good many were passed over. I would begin "with the lowest of those officers who were pro- "moted on the 28th of November 1854, and I would "promote all those above that officer, and date "them from the 28th of November 1854." That is what he proposes, which I take it is your view of the case. Appendix, page 63.

769. My view of the case was that all lieutenant-colonels, whether they commanded regiments or not, should be put in the same category, and all promoted at the end of three years, did such a proposition as that ever come before them ?—I think you will see a reference to it in the report. I think it may be inferred from what you read here : "We are, therefore, "of opinion that the cases of these 115 officers can- "not be subjected, without injustice, to any arbitrary "classification for separate treatment, and must be "considered as a whole. On this principle it has "been suggested that the effect of the warrant, "whether advantageous or disadvantageous, should "be postponed as regards all lieutenant-colonels of "date prior to 20th June 1854, and that the officers "passed over be replaced in their relative positions "as if the old rule of seniority, irrespective of service, "had never been departed from, and the new rule of "seniority by service had never been introduced." Report of 1858, page 13

770. So far that was done ?—Yes, that was done by the antedated brevet. "This arrangement, while "remedying a hardship inflicted by the warrant "on the 115 officers passed over, will, of course,

*Maj. W. Marvin.*

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"make a change somewhat to their disadvantage in "the position of the 206 officers promoted after "three years' service, who, though they will not "lose rank, will lose the benefit of their relative "position and their consequent proximity to the "top of the colonels' list, which they have acquired "by service, under the warrant. The nature, "however, of the hardship suffered by the 115 "lieutenant-colonels over whom others have passed, "or the injury to those who have thus gained "their promotion over the heads of their 115 "comrades, and who would lose that advantage, "differs very much. The former have been most "injuriously affected by the loss of advantages to "which their rank entitled them, at the time "when they acquired or purchased it, and they are "still without a rise in rank which by this time they "would have acquired under the old system. The "latter would not lose rank, but would be deprived "of a portion of an additional advantage which they "never expected nor contemplated when they "acquired their lieutenant-colonelcies. Those, too, "of the 115 who have not served the required time "as field officers, will not in any way interfere with "the prospects of the officers who have so served and "have been promoted, since the former never can "fill vacancies on the fixed establishment of "generals. The latter, moreover, can be no "pecuniary losers, for they did not acquire their new "rank by purchase; and they will have acquired, "by their earlier promotion to the rank of colonel, "and will preserve, their earlier eligibility for em-"ployment with temporary rank in major-general's "commands, and the consequent prospect of rising "earlier than they otherwise would have done to "the rank and pay of major-general. The former "class, on the other hand, are now actually damnified "by the operation of the warrant, and have gained "nothing in compensation, though many of them are "ceasing to receive the prospective value for their "last outlay of purchase money. It appears, there-"fore, to us, after carefully weighing the amount of "hardship and inconvenience which will be undergone "by allowing the operation of the warrant on the "lieutenant-colonels of 1854 to remain undisturbed, "or by replacing the lieutenant-colonels passed over "on the list of colonels according to their original "seniority, there will be less hardship and incon-"venience suffered by adopting the latter than the "former cause. It appears, however, to us that it "will be less invidious to the promoted colonels, to "whom every consideration is due, and will mark "more clearly the object and intention of the pro-"ceeding, if the original error, committed in 1854 be "now rectified by granting and antedating an ex-"tension of the brevet given in that year, so as to "embrace all the lieutenant-colonels who held that "rank prior to June 20, 1854."

771. (*Lieut.-Gen. the Earl of Rosslyn.*) Does that refer to the aides-de-camp and to the officers promoted for distinguished service?—No, it is the qualified colonels promoted under the three years' rule. It has no reference to the distinguished service officers; it might, in the minds of the Commission, have a reference to them also, because they would be dove-tailed into the list amongst the colonels qualified by service, but they are not specifically mentioned in the report.

772. (*Chairman.*) The report would show us what their recommendations were?—Yes; the report says: "It appears, however, to us, that it will be less in-"vidious to the promoted colonels, to whom every "consideration is due, and will mark more clearly "the object and intention of the proceeding, if the "original error committed in 1854 be now rectified "by granting and antedating an extension of the "brevet given in that year, so as to embrace all the "lieutenant-colonels who held that rank prior to June "20, 1854." That is in the warrant, in either the 14th or 17th clause.

Report of 1858, page 13.

773. (*Maj.-Gen Russell.*) If you had read the next paragraph but one you would have seen that it referred to the then existing interests?—It says, "Having "thus then endeavoured to explain and remove the "hardships entailed on then existing interests by "the operation of the warrant of 1854, and having "satisfied ourselves that the principle of that warrant "is not only sound, but must be preserved as indis-"pensable to the efficiency of the upper ranks of the "army, we propose to leave it undisturbed as regards "the future, though we recommend some further "modifications in detail, which will, we think, facilitate "and simplify its working. And we propose to lay "down certain principles by which we think its "application should be restricted."

Report of 1858, page 1

774. That proves that what you read refers entirely to the officers who had been superseded?—Quite so.

775. (*Gen. Sir G. Brown.*) If that commission had recommended that the lieutenant-colonels should all rise alike at the end of three years, do you not think that there would have been no hardships and no difficulty raised at all; there could not have been any ground of complaint against the aides-de-camp, because that was an established rank of the army; and with re-spect to the officers promoted for distinguished service in the interim, the lieutenant-colonels would have got such an immense boon, by getting promotion at the end of three years, that they would not have com-plained at being superseded in that manner?—I think the lieutenant-colonels would have been perfectly satis-fied if they had been told that whether they were qualified or not they would be promoted to Colonel at the end of three years.

776. (*Maj.-Gen. Russell.*) If they had all originally been made colonels in 1854 at the time to which they were afterwards antedated, the distinguished service colonels and the aides-de-camp would have been perfectly satisfied to be placed below them, would they not?—They could not have objected to it, cer-tainly.

777. (*Maj.-Gen. Rumley.*) In 1854 two new fea-tures were introduced with regard to the promotions from the rank of lieutenant-colonel to that of colonel, namely, distinguished service, and service of three years?—Yes.

778. I think you stated that if you had been called upon to frame a warrant upon the recommendations of the Commission of 1854 you would have taken up the lieutenant-colonels senior to those qualified by three years' service for promotion?—Yes.

779. Would you have applied the same rule in pro-moting the colonels for distinguished conduct and taken up their seniors also; that being another new feature introduced in 1854?—No; I should have let them fall into their places according to their dates, the same as the Queen's aides-de-camp.

780. Then you would have made a distinction between the two new features introduced by the warrant of 1854?—The qualifying rule is one thing, and promotion for distinguished service is another, and I would have treated them differently.

781. But they are both new features of that warrant?—Yes, they are both new features of that warrant; but I cannot see how, with the distinguished service officers, you can carry out your rule, because you require those carried up to be governed by the three years' rule. That very question was put to General Lindsay in his examination. The chairman says: "But "if an officer, being a lieutenant-colonel, is pro-"moted to colonel for distinguished conduct in the "field, he would not carry anybody up with him; "would you not consider that an exceptional case?—"Yes, in this way, if what we are calling justice was "given to those officers who are passed over, they "would have been promoted to colonel before the "officers who were promoted for distinguished con-"duct in the field, and therefore they would be above "them. In that way the officers who are promoted "from lieutenant-colonel to colonel will be affected, "and in no other way." So that there General Lindsay did not propose that the distinguished service colonels should carry up the others.

Appendix, page 63.

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782. My question is, with regard to framing that warrant, as these were two new features, would you have dealt with the cases differently ; in the one case would you have taken up the lieutenant-colonels senior to them, and in the other would you not ?—I have expressed such an opinion. You put the question to me for an opinion, the opinion I give is, that I would not have carried anybody up with the distinguished service officers.

783. (*Chairman.*) Was not the object of the Royal Commission of 1858 to protect those officers, who had been lieutenant-colonels previously to the 20th of June 1854, from any supercession arising out of the new warrant ?—Yes.

784. That would have been fully effected by the three years' rule, if only the three years' rule had been in your contemplation ; but, in order to protect them against being superseded by the officers promoted for distinguished service, it was necessary to antedate all their commissions to the 28th of November 1854 ?—Yes, but going back again to this Gazette, it says, "Officers promoted by the following brevet "will receive their promotions subject to the new "regulations about to be promulgated by Royal "warrant." Those new regulations were contained in the warrant of 1854. I quite understand the case which has been put to me, namely, that the promotion for distinguished conduct in the field otherwise than by appointment as Queen's aide-de-camp was a new element altogether.

London Gazettes of 1854, page 1931.

785. And the Royal Commissioners having recommended in their Report that the existing interests should be protected, if you had been desired, by the Secretary of State for War, as you were in 1858, to draw up a warrant in compliance with the recommendations of the Commission, should not you have carried it out by protecting them in that respect ?—On further consideration I admit that, keeping in view the principle of existing interests, it would be right to do so in some way, but I am not prepared to say how. My difficulty is this : when the warrant of 1854 was ordered to be prepared, a war was actually going on, so that the introduction of a clause applying the "carrying up principle" to lieutenant-colonels promoted to the rank of colonel for distinguished service, whose commissions as lieutenant-colonels were of subsequent date to 20th June 1854, would at once have had the effect of neutralizing the intended three years' clause so far as the lieutenant-colonels of dates anterior to 20th June 1854 were concerned, who would all have gone up ; while by confining the "carrying up principle" to the three years' men, the qualifying rule with reference to the old lieutenant-colonels would have lasted at least three years, *i.e.*, until 20th June 1857, when the first qualified lieutenant-colonel of 20th June 1854 would have become a colonel, then leaving the qualifying clause to go on as at present amongst the lieutenant-colonels promoted to that rank after 20th June 1854.

786. And you would not have been carrying out, as strictly, the recommendations of the Commission in 1854, as you did those of 1858, where you say you can quote paragraph against paragraph, if you neglected to do that in 1854 ?—I admit that I should not.

787. (*Lieut.-Gen. the Earl of Rosslyn.*) The warrant of 1858 may be considered as a supplement to that of 1854, may it not ?—Not a supplement, but an entire revision of the warrant of 1854.

788. Not a correction ?—So far a correction that certain clauses of the warrant of 1854 were retained in the warrant of 1858, and others altogether expunged, so that what was kept from the warrant of 1854, and the new provisions recommended by the Commission of 1858, formed the new warrant.

789. It was to revise an error which was admitted to have existed in the warrant of 1854 ?—Yes.

790. (*Chairman.*) In consequence of the Report of the Royal Commission of 1858, the commissions of a very large number of officers were antedated to the 28th of November 1854. I suppose that was to a certain extent a new measure, was not it ?—Certainly, it goes back four years, you observe.

791 Her Majesty has a perfect right to antedate the commissions, and there is no rule to the contrary ?—Certainly, and it is frequently done. There are many precedents in the department for antedating commissions.

792. We have heard a great deal about Royal Commissioners and Royal Commission, but, in point of fact, a warrant is the act of the Sovereign ?—Quite so.

793. The reports of Royal Commissioners are merely advice tendered to the Sovereign, which she may or may not be advised to take ; in fact, a report has no operation except what the Sovereign chooses to give to it ?—Quite so.

794. The warrant is the act of the Sovereign, and those officers promoted under the warrant of 1858 are as much officers as those promoted under the warrant of 1854, or as the distinguished service officers and aides-de-camp were in 1855 ?—Yes.

795. (*Lieut.-Gen. the Earl of Rosslyn.*) In the event of any officer being entitled to extra pay, would that antedate apply ?—Promotion to the rank of colonel carries no extra pay, and therefore it did not become a question.

796. It would not have carried the pay, would it ?—Certainly not, in some cases where an officer has been promoted to a vacancy, for which the issue of pay had for a time not been made, the antedate would have carried the arrears.

797. (*Maj.-Gen. Russell.*) Is it not frequently specified in the Gazette, "such antedate not to carry back pay" ?—Frequently.

The witness withdrew.

Adjourned.

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## At the War Office, Pall Mall, Thursday, 28th May 1863.

PRESENT :

Lieut.-Gen. Right Hon. J. PEEL.
Right Hon. E. P. BOUVERIE.
Gen. Sir ALEXANDER WOODFORD, G.C.B., G.C.M.G.
Gen. Sir GEORGE BROWN, G.C.B., K.H.
Lieut.-Gen. Right Hon. the EARL OF ROSSLYN.
Maj.-Gen. Sir WILLIAM BRERETON, K.C.B., K.H.
Maj.-Gen. HENRY SANDHAM.
Maj.-Gen. DAVID RUSSELL, C.B.
Maj.-Gen. RANDAL RUMLEY.

LIEUT.-GEN. RIGHT HON. J. PEEL IN THE CHAIR.

Colonel GEORGE CAMPBELL, C.B., (*Inspector Field Officer of the Leeds Recruiting District*), examined.

*Col. G. Campbell.*

28 May 1863.

798. (*Chairman.*) You have expressed a wish, I believe, to make a statement to the Commissioners appointed to inquire into the case of the distinguished officers, and Queen's aides-de-camp ?—Yes.

799. Will you have the kindness to do so ?—I understand that the object of this Royal Commission is to test the claims that were brought forward by certain officers whose commissions bear a date junior

*Col. G. Campbell.*

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to that of my own; the result of that claim may possibly be to place me, instead of being their senior, their junior; this, I consider, would be a direct act of supercession, and I come here to protest against it.

800. Will you have the goodness to state what your position was; were you a lieutenant-colonel previously to the 20th of June 1854?—Yes.

801. By the action of the warrant of 1854 several officers were placed over your head; is that the case?—No, not in 1854; I should have been placed over the heads of other officers; I was a regimental lieutenant-colonel in command of a regiment; the date of my commission is 1853, and, had that warrant continued in force, I should have got the benefit of the three years' service clause, which would have made me a full colonel, and brought me over the heads of many lieutenant-colonels who were on half-pay, not doing duty with their regiments.

802. Since 1856, when you completed your three years' service as lieutenant-colonel, commanding a regiment, many officers have been placed over your head, who had been made aides-de-camp in the meantime, or been promoted for distinguished service in the field?—Yes.

803. The operation of the warrant of 1858 was to place you back again in your original relative position to the other officers as you stood in 1854, was it not?—That was the operation of the warrant.

804. Its operation was to antedate your commission to the 28th of November 1854, and to replace you exactly in the same relative position as that which you held before any warrant came out at all?—Yes, I believe that was the effect of the warrant.

805. And you now object to any further alteration?—Yes, I object to being deprived of the advantages of the commission which I hold; I hold a colonel's commission of November 1854, and I wish to keep it.

806. You are in the same position as if there had been no warrant?—I am.

807. (*Mr. Bouverie.*) Did you become a colonel by three years' service?—I did. I became a full colonel.

808. At what date was that?—In May 1856.

809. By the operation of that three years' service rule you passed over the heads of a good many officers, as I understand, who were on half-pay, and had not an opportunity of serving three years?—Yes, and by the operation of the warrant of 1858 I was put below those officers, but above those who had, in a measure, superseded me in the meantime.

810. (*Gen. Sir G. Brown.*) Were you better off under the warrant of 1854 than under that of 1858?—I have not made a nice calculation upon that point, but I think, so far as my relative position in the *Army List* goes, I was better off.

811. The warrant of 1858 put some officers over your head?—Yes.

812. (*Chairman.*) If you were better off, others must have been worse off, must they not?—Certainly. Those who were brevet lieutenant-colonels, or lieutenant-colonels not in command of a regiment, before 1854, all suffered. I went over their heads.

813. (*Maj.-Gen. Russell.*) The objection, which you now feel, is that which is natural to all officers, namely, the objection to be superseded by juniors?—Yes; at the same time I do not allow that there is any just claim for that supercession.

814. (*Maj.-Gen. Sir W. Brereton.*) You served in India, did not you?—Yes.

815. With your regiment?—Yes.

816. I think you came home desperately wounded?—Yes, I was wounded, but I suffered more from an illness which I attribute entirely to a case of supercession. Perhaps nobody has suffered more in the service than I have done from that circumstance. No one knows what it is to suffer from a supercession better than I do.

817. (*Gen. Sir A. Woodford.*) Have you had any particular case of supercession?—Yes, there was a case in the Punjaub, when the mutiny commenced. I was stationed at Sealkote in command of my regiment, and was a full colonel; a moveable column was formed in the Punjaub, and my regiment was detailed as, in fact, the European portion of it, and I found myself placed under the orders of a captain in the Company's service and a brevet lieutenant-colonel; he was the present Sir Neville Chamberlayne. I remonstrated against my position to Maj.-Gen. Reid, then in command of the Punjaub, although he kindly told me that it was from no want of capacity that I had been superseded; but, on account of the exigency of affairs, it could not be helped.

818. (*Maj.-Gen. Sir W. Brereton.*) Was it in consequence of that supercession that you suffered so severely from illness, as you just now mentioned?—Sir Neville Chamberlayne was appointed adjutant-general of the army, and I was a second time superseded by another captain and brevet lieutenant-colonel, who was the late lamented Brigadier-General Nicholson. Both of these cases occurred in the course of six weeks, and it is to those supercessions that I attribute the deterioration of my health—it was owing to the way in which it affected my mind from morning to night constantly.

819. You wish to exemplify, in that manner, how grievous it is to an officer, especially on service, to be superseded by a junior officer?—Certainly.

820. (*Maj.-Gen. Russell.*) After commanding a brigade you, being a full colonel, received no further promotion?—No; I received nothing but a lieutenant-colonel's prize-money, and they, as brigadier-generals, received a brigadier-general's prize-money.

821. (*Maj.-Gen. Sir W. Brereton.*) You commanded a brigade at Delhi, did you not?—I did; and, as I say, I got only a lieutenant-colonel's prize-money; while they got a brigadier-general's prize-money.

822. (*Chairman.*) It had never been the custom, had it, previously to 1854, to appoint from the rank of lieutenant-colonel to that of colonel by any other means than by strict seniority, or by certain positions in the guards and the household troops which carried with them the rank of colonel?—No, I am not aware of it. I always considered that the rank of lieutenant-colonel was protected by the usages of the service. In fact I do not recollect any instance of officers, unless they were very near the top of the list, being promoted to be Queen's aides-de-camp. They were taken in that way sometimes, but certainly they were not taken from the bottom of the list and put over all the lieutenant-colonels; that was never done.

The witness withdrew.

*J. Croomes, Esq.*

JOHN CROOMES, Esq., examined.

823. (*Chairman.*) What position did you hold in the War Office in the year 1854?—I was chief clerk.

824. Did you draw out the warrant of 1854?—No, I did not. It was drawn out in the promotion room, but I was with Mr. Sidney Herbert when he corrected the rough draft of that warrant, and the particular clause relating to promotion was wholly in his handwriting.

825. Do you consider that the warrant of 1854 carried out the recommendations of the Royal Commissioners of 1854?—I do consider that the warrant of 1854 carried out those recommendations, with one exception, namely, that we forgot, during the whole of the war, and afterwards until the year 1858, the recommendation of the Commissioners that the interests of those lieutenant-colonels who were passed over by the three years' service colonels should be protected: they were neglected entirely.

826. That was a most important point, was it not?—Yes, it was most important, but it was forgotten.

It was the Secretary-at-War himself who drew out the draft. He did not mention it in his draft warrant, and therefore the clerks did not think of it.

827. The clause of the report of the Royal Commission, which you state to have been overlooked in the drawing up of the warrant of 1854, was clause No. 52?—Yes; they say "we are of opinion that a "liberal view ought to be taken of the claims of "these officers, and that in introducing a change" (which change was the abolition of brevets) "which "the public good requires, they ought to be carefully "protected from injury and from having their just "expectations disappointed."

828. Will you read the previous paragraph?—"We "have hitherto considered the question before us "only with reference to the permanent system of "promotion to be established; we are, however, "aware, that if this system were at once substituted "for that which has been hitherto in force, without "adopting some means to protect the interests of "those whose prospects would be affected by the "change, much injustice would be inflicted on many "officers who have relied on the continuance of the "present regulations."

829. Do you not take that to mean the regulations that were then in force with regard to the promotion from the rank of lieutenant-colonel to that of colonel?—Yes, that was by brevet.

830. It was always by brevet?—Yes.

831. Previously to 1854, the only promotion from the rank of lieutenant-colonel to that of colonel was by strict seniority, with the exception of officers appointed by the Sovereign to be aides-de-camp, and of certain ranks in the guards, artillery, and engineers, which carry with them the rank of colonel?—I know nothing about the artillery and engineers, but certainly, with the exception of Queen's aides-de-camp and officers promoted for distinguished service, all the promotions had been by seniority, and, in fact, by brevets generally once every third or fourth year.

832. Can you give me any instance of an officer having been promoted from the rank of lieutenant-colonel to that of colonel for distinguished service without being made a Queen's aide-de-camp?—No, it was the custom to make them Queen's aides-de-camp. I do not know of any instance of promotion in the other form. Lord Hardinge and Mr. Sidney Herbert were members of the Commission of 1854, and the moment after they came from the Commission they chose the brevet, and they took in all the officers who, in their judgment, had been lieutenant-colonels of sufficient standing.

833. (*Maj.-Gen. Sir W. Brereton.*) Applying, in fact, the new rule?—Applying that rule to the promotion by brevet.

834. (*Chairman.*) That was on the 20th of June 1854?—Yes.

835. That brevet took them in their regular rotation, without reference to service?—Yes, it took all the lieutenant-colonels of sufficient standing.

836. It took them in regular rotation to a certain point?—Yes.

837. Leaving the others to be protected as the Commission recommended?—Yes, so that their just expectations should not be disappointed.

838. You stated that there had been cases of officers who had been appointed Queen's aides-de-camp for service in the field, that was not a necessary qualification for the appointment, was it?—I imagine not, I think the Queen could have appointed anybody.

839. It was an undoubted prerogative of the Crown, without reference to service?—I think so.

840. Therefore the rule of promoting from the rank of lieutenant-colonel to that of colonel for service in the field, which had been previously strictly confined to the junior ranks of the army, (as in the case of captains promoted to be majors, and majors to be lieutenant-colonels,) was the introduction of a new system by the warrant of 1854?—Yes, the new system, which was introduced in 1854, was simply that a lieutenant-colonel who had served in command of a regiment for three years should, in virtue of that, get his colonelcy.

841. Was not there a new system introduced of promoting for distinguished service in the field from the rank of lieutenant-colonel to that of colonel?—My memory does not serve me with reference to that.

842. Is not that included in the warrant?—Yes, I find it in the warrant. The reward for distinguished service is evidently a novelty.

843. Do you not consider that that was one of the novelties from which the Royal Commissioners in 1854, as appears by the clause in their report to which we have referred, considered that those, who had been previously lieutenant-colonels, had a right to be protected? Was it not interfering with the regulations of the service which had previously existed?—The promotion for three years' service was a novelty altogether; in promoting a lieutenant-colonel because he had served three years in the field the interestsof all his senior lieutenant-colonels were lost; but I will just assume, for a moment, that that Commission had not existed, then if Sir Thomas Troubridge and the other officers had been made Queen's aides-de-camp at the time they would have had an undoubted right to be colonels before every lieutenant-colonel in the army.

844. (*Maj.-Gen. Rumley.*) You speak of the Queen's aides-de-camp only, not the distinguished service colonels, as I understand?—No, not the distinguished service officers. The Queen's aides-de-camp would have had an undoubted right to pass over every lieutenant-colonel.

845. (*Maj.-Gen. Russell.*) Were officers always made colonels when appointed Queen's aides-de-camp?—Yes, invariably, I believe.

846. (*Gen. Sir G. Brown.*) There have been exceptions, have there not. Do you remember the case of colonel Fox?—I do not, but, at all events, you call it an exception to the rule.

847. (*Maj.-Gen. Sir W. Brereton.*) I think, if you look in the *Army List* of 1813 or 1814, you will find five officers then serving as lieutenant-colonels who were aides-de-camp, and who had been serving for a long time in that position?—It may be so.

848. (*Chairman.*) If, even after the issuing of the new warrant on the 6th of October 1854, which gave the power of promoting for distinguished service in the field, until the 12th of December 1854, a brevet having come out after the battles of Alma, Balaklava, and Inkermann, promoting many captains to the rank of major, and many majors to the rank of lieutenant-colonel, not a single officer was promoted from the rank of lieutenant-colonel to that of colonel for distinguished service, would not you consider that a proof of what had been the custom and regulation of the service previously?—I really have no recollection of it; I had very little to do with the promotion room latterly while I was in the office, and my memory does not furnish me with any instance of a distinguished-service officer being promoted as such.

849. (*Gen. Sir G. Brown.*) Was the recommendation of the Commissioners of 1854 intended to protect the lieutenant-colonels then on the list from the operation of the prescriptive right of the Crown to promote officers as aides-de-camp, or only to protect them from the operation of the three years' rule?—I think to protect them simply from the three years' rule.

850. (*Mr. Bouverie.*) Not from the promotion of the distinguished service officers?—No.

851. That had not been thought of?—I do not recollect any cases of distinguished service colonels promoted as such, they were made Queen's aides-de-camp. Sir Thomas Troubridge, Colonel McMurdo, and several others, were made Queen's aides-de-camp; that was most likely for distinguished service.

852. (*Gen. Sir G. Brown.*) Would protection have been effectually afforded to them, by promoting the lieutenant-colonels on the list, either as their juniors respectively became qualified, or at dates three years subsequent to the dates of their lieutenant-

colonelcies?—The great protection which ought to have been accorded to the lieutenant-colonels not promoted by the brevet of June 1854, ought to have been, that any lieutenant-colonel, who was promoted to be a colonel after three years' service, should have pushed up every one of his seniors.

853. You have had very long experience at the War Office, can you tell me whether there is any instance, within your recollection, in which the dates of officers' commissions have been retrograded, that is, have been dated by retrogression, those officers being put down on the list?—Only as a punishment. I know of no other instance.

854. I ask the general question, whether it has been the practice at the War Office ever to do so?—It has not been at all the practice.

855. Is there any precedent for the prerogative of the Crown being used to such an extent as it was in 1858, by promoting a large body of officers by antedating their commissions, and by passing them over the heads of the officers who had been promoted in the interim?—I do not know of any such instance. There have been instances of antedated commissions being given to officers individually, upon their representations that they were unfairly treated, or something of that sort, but that was in individual cases only, to rectify an error

856. (*Mr. Bouverie.*) Not as a favour to the officers so antedated, but merely to set right what had been done wrong?—Merely to set right an error.

857. (*Chairman.*) You stated that Mr. Sidney Herbert drew out, or corrected, the warrant of 1854?—He did.

858. What position did he hold at the time?—He was secretary at war.

859. Afterwards, as Lord Herbert, or still as Mr. Sidney Herbert, I think he was the chairman of the Royal Commission of 1858, was he not?—He was.

860. And took part in the alteration which was then made?—Yes, but there is not anything in the Report of 1858, as I read it, relating to the aides-de-camp of the Queen, or to the injury done to them by the promotion of all those officers.

861. You consider then that he a second time overlooked the interests of a certain class of officers?—There is not an allusion to them in the whole of the Report of the Commission of 1858. I do not think there is a single word which bears upon it.

862. Although there is not a single word in the report did you see the evidence that was taken before that Royal Commission?—I did not read the evidence, if I had it. I wrote the letter, which is before you a day or two after Sir Thomas Troubridge wrote to me.

863. If you read the evidence you will find that several questions were put to the witnesses upon that very subject?—That may be, but in the report there is not a word about it. I only took the report. I only argued upon that report.

864. I understand that you argue that the case of those officers was overlooked by that Commission, because it is not mentioned in the report?—I do.

865. But the attention of the Commissioners must have been drawn to it, evidently, by several questions put in the examination of the witnesses, must it not?—Their attention ought to have been drawn to it.

866. Do you not consider that the two paragraphs in the report of the Commission of 1858, Nos. 66 and 67, relate to those distinguished officers: "By distinguished conduct in the field, the Commissioners of 1854 meant conduct so conspicuous as to justify a promotion so exceptional, and did not contemplate its application to the large numbers of officers, heads of departments, seniors of regimental ranks, &c. &c., to whom it has become customary to give a step by brevet, not only after general and even partial actions, but at the conclusion of military operations. Indeed, the granting of steps by brevet has had so little reference to individual service, that it has been held to be a slur on any officer occupying a certain rank or position to be omitted from the list." The report also includes a list of the officers, does not it?—It does.

867. And therefore it may be naturally inferred that their attention was drawn to that subject?—Yes.

868. (*Maj.-Gen. Rumley.*) Those officers were also distinguished, at page 49 of the Appendix, by having a D put after their names, were they not?—Yes, I imagine those are all Queen's aides-de-camp.

869. (*Chairman.*) There are two distinct batches; the first batch was made Queen's aides-de-camp, the second batch were promoted for distinguished service; then comes another batch of Queen's aides-de-camp, and then another batch of distinguished service officers, is not that the case?—Yes, but I was not before aware of this.

870. (*Maj.-Gen. Rumley.*) Those officers having been so marked, in the appendix which was attached to the report of the Royal Commission, do you still consider that there was an oversight on the part of the Commissioners with respect to their case?—I still consider that there was an oversight in the warrant of 1854.

871. I am speaking of the report of 1858?—I think there was an oversight of the injury that would be done to those aides-de-camp who had been promoted in the meantime.

872. Not to the distinguished service officers?—To them too, if they get their promotion specially, which I had supposed to be as Queen's aides-de-camp.

873. Do you consider it was an oversight of the Royal Commissioners?—I think it was an oversight in the report.

874. Notwithstanding that they are marked in the Appendix?—Notwithstanding that they are marked in the Appendix. At the time when I had this report I had, I think, no more sent to me by Sir Thomas Troubridge than the report itself.

875. (*Mr. Bouverie.*) May I ask the ground for your opinion, that there was an oversight on the part of the Royal Commission?—Simply that it is not noticed in the report. I think it has been stated in the papers that Lord Herbert himself was of opinion that it had been an oversight on his part.

876. (*Gen. Sir A. Woodford.*) Do you refer to the report or the warrant?—In both the warrant of 1854 and in the report of 1858.

877. (*Mr. Bouverie.*) Should you be disposed to alter your opinion, if you were assured by two members of that Commission that the matter had been considered, and fully considered, by them?—I should say that if it had been considered something with respect to it ought to have been stated in the report.

878. (*Chairman.*) There was no special application on the part of those officers before that Commission of 1858, was there?—That Commission was appointed to look into the injury done by the three years' promotion.

879. (*Maj.-Gen. Sandham.*) The object was to investigate the injury done by promoting the lieutenant-colonels previously to 1854, was it not?—Yes; it appears so.

880. (*Maj.-Gen. Rumley.*) Did I understand you to say that the brevet of the 20th of June 1854 included all those lieutenant-colonels who had completed their three years' service?—I think it included every lieutenant-colonel whom the Commander-in-Chief and Secretary-at-War thought of sufficient standing.

881. Would you like to refresh your memory by reference to any *Army List* of that date?—The promotion which took place on the 28th of Nov. 1854 included Colonel Charles Hagart, who became a lieutenant-colonel of the 31st of October 1851.

882. I speak of the brevet of the 20th of June 1854?—That went no further than Colonel Windham, who was a lieutenant-colonel of 1846.

883. I think you stated in your evidence that it included all those who had qualified up to that date?

—I meant the promotion of the 28th of November 1854.

884. You stated the 20th of June ?—Certainly, I did inadvertently say 20th June 1854, meaning all the promotions of 1854, but all the promotions of 1854 in no respect prejudiced the officers who would afterwards get promotion for distinguished service. They could not have been prejudiced in any way. Nothing prejudices them, and nothing puts them down, except the warrant of 1858 by promoting every lieutenant-colonel of June 1854.

885. (*Gen. Sir G. Brown.*) If the Commission of 1858 had recommended that all the lieutenant-colonels prior to June 1854 should take rank as colonels from the dates respectively of three years subsequent to the dates of their lieutenant-colonelcies, would not that have satisfied all the reasonable claims to protection ?—Yes, I think it would.

886. They had no reasonable claim to protection beyond that ?—No.

887. (*Maj.-Gen. Russell.*) Do you not think that some of the colonels, originally promoted on the 28th of November 1854, would then have claimed the three years from the date of their appointment as lieutenant-colonels ?—No, because they were promoted under a newly introduced system.

888. On the 28th of November 1854 the new system came in, and many of the colonels were then of seven years' standing ; would they not have been made colonels after the end of three years ?—In introducing altogether a new system you make an exceptional rule. Those long lists of colonels of 1854 could certainly not have been all promoted by three years' service as lieutenant-colonels.

889. No lieutenant-colonel promoted on the 28th of November 1854 had served less than three years, either in his regiment or on a staff appointment ; some of them had served nearly seven ?—That question does not at all affect the question that is now before you.

890. (*Maj.-Gen. Rumley.*) Do you demur to answer the question ?—What I mean is, that the promotions of 1854, whether they were for the three years' service or by a special brevet, do not at all affect the case of those officers who were made Queen's aides-de-camp in 1855-6, which is the case before the Commission.

891. There is something more besides the case of the Queen's aides-de-camp before us, namely, that of the distinguished-service colonels ?—The distinguished-service promotion granted by that warrant is a novelty as a general rule.

892. (*Maj.-Gen. Russell.*) The Gazette of 28th November 1854 says : "The under-mentioned officers "having completed three years' actual service as regi- "mental lieutenant-colonels, or in other appointments "equivalent to those situations, to be promoted to the "rank of colonel in the army, in accordance with the "provisions of Her Majesty's Royal warrant of the "6th October 1854, the commissions to bear date the "28th November 1854" ?—You are quite right, but I was not aware that all the promotions of 28th November 1854 were of that nature.

893. That was the first promotion under this new regulation ?—Yes.

894. Some of those officers, as I stated, were about seven years lieutenant-colonels ?—Yes, they were.

895. Would they not have claimed the benefit of the three years, had that been the rule throughout ?—Yes, but I should think not under a new rule.

896. (*Chairman.*) The report of the Royal Commission of 1854 was dated the 17th of June 1854 ?—It was.

897. And contained a recommendation that existing interests should be protected ?—It did.

898. But that recommendation would only extend to those who held the rank at that time ?—At that moment.

899. The brevet of the 20th of June 1854 was accompanied by a note, that the officers promoted by that brevet would be subject to the operation of the new warrant, although it was not then issued, was not that so ?—I do not understand what that could have meant, except to the then made lieutenant-colonels and majors.

900. In consequence of that note they were subject to the provisions of any new warrant ; that is all you understand by it ?—That is all.

901. Do you consider that that was a sufficient notification to all officers who should obtain their promotion afterwards, that they should be subject to a subsequent regulation ?—I do not know that it would be a sufficient notification to those that were not then promoted, but the moment the warrant came out there was a sufficient notification.

902. There were officers appointed between the 20th of June and the 6th of October who complained very much of that warrant having had a retrospective effect upon them, because it was not out at the time when they obtained their promotion ; it is quite evident, is it not, that that warrant would affect all those officers who were promoted under that notification ? — Unquestionably all those who were promoted then, but I do not know that such a notice as this in the Army List would affect any officers who were not then promoted, at least not until that warrant came out.

903. Would not the effect of that be, that the warrant was to have effect on the officers promoted on the 20th of June, but was not to have effect upon the officers who were promoted subsequently to them ?—There would be very few appointed subsequently to the 20th of June.

904. Our Commission says : "It has been repre- "sented to Us that certain captains and lieutenant- "colonels of the guards, who were promoted to that "rank between the 20th of June 1854, and the "issuing of the warrant of 6th October of that year, "consider that their positions in the army have been "unduly injured by the operation of the said warrant "of 6th October 1854, and also by the subsequent "warrant of 14th October 1858 ?"—I can hardly see that.

905. Because, previously to the issuing of the warrant of 1854, it did not require a certain length of service for a captain and lieutenant-colonel of the guards in order to become a colonel, which was rendered necessary by the warrant of 1854 ?—But they got their promotion before the date of the warrant, therefore I do not see how it could affect them in any way.

906. Other officers by that promotion were placed over their heads ?—The notification in the Gazette is only, in my estimation, sufficient for those officers who were afterwards mentioned ; that is to say, for those who were promoted at that time.

907. Colonel Carleton in his evidence says, "I "was promoted to a company of the guards, with the "rank of lieutenant-colonel, after 16 years' ser- "vice, on the 15th July 1854. I found myself, in the "month of January 1862, superseded by 165 officers, "of whom 14 were junior to me in every rank in the "service ?"—That is a question that I have not looked at at all ; I cannot give an opinion upon it, but it seems, under the former privileges of the guards, a hard case.

908. I think you have given a very decided opinion that the notification in the Gazette would apply only to those whose names appear in the same Gazette ?—For myself, I think it would apply only to the officers who are hereafter mentioned :—"Officers promoted "by the following brevet will receive their pro- "motions subject to new regulations." It does not say that all other officers not now promoted will be in the same position.

909. Hereafter to be promoted ?—Yes.

910. I think you began by saying that you thought the protection, recommended by the Royal Commission of 1854, was limited to those officers who held the rank of lieutenant-colonel previously to the 20th of June ?—Yes.

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911. It would not extend to those appointed to that rank subsequently to that period?—No. For instance, a major may be promoted to be lieutenant-colonel by brevet, but when he becomes a lieutenant-colonel he cannot become a colonel now until he has served three years.

912. And you think that any officer appointed subsequently to the 20th of June 1854 would naturally be subject to that rule?—Certainly. There is one thing which I may mention. If the Commission of 1854 had recommended that every lieutenant-colonel of the 20th of June 1854 should be made a colonel, there would not have been a single lieutenant-colonel in the army. That is the spirit and action of the warrant of 1858, namely, that every lieutenant-colonel should be promoted.

913. With the exception of their being called colonels instead of lieutenant-colonels, it only retained them in their relative positions, it gave them no additional pay, did it?—It gave them only the name of colonel.

914. It gave them no additional pay, and kept them in their relative positions?—Yes.

915. But there was no period of service required in the rank of lieutenant-colonel to qualify for becoming a colonel, was there?—The brevet generally put up officers who had served three, four, or five years.

916. There was no rule requiring a certain service, was there?—No rule; it was an arbitrary matter between the Commander-in-Chief and the Secretary at War.

917. (*Maj.-Gen.-Russell.*) If all the lieutenant-colonels had been made full colonels on the 28th of November 1854, you stated, did you not, that there would have been no lieutenant-colonels in the army?—I say that if all the lieutenant-colonels of the 20th of June 1854 had been promoted by one brevet, there would have been no lieutenant-colonels left.

918. Would not there have been the 100 officers or so promoted at that very date. Those who became lieutenant-colonels on the 20th of June 1854 would have been lieutenant-colonels still?—Yes, but all those majors who became lieutenant-colonels on the 20th of June 1854, were promoted I think.

919. No, they were promoted subject to the provisions of the warrant about to be published, but which did not come out till October 1854, therefore you would have had as lieutenant-colonels in the army all the officers who were made lieutenant-colonels on the 20th of June, including all who were made up to the 28th of November 1854, that is 250 probably?—Yes.

920. (*Chairman.*) The warrant of 1858 did not take in those officers appointed lieutenant-colonels on the 20th of June 1854?—No, but several had become colonels by three years' service before 1858.

921. Therefore you were hardly correct in saying that, if they had made all the then lieutenant-colonels colonels, there would have been no lieutenant-colonels in the army?—No, I was not correct in that, and should have said except those appointed on the 20th June 1854, and before the warrant of 6th October.

922. (*Maj.-Gen. Russell.*) I believe there is no question as to the lieutenant-colonels promoted colonels on the 20th of June 1854; the only question is as to what has been done with those who were lieutenant-colonels previously to that date, and not then promoted, whether they should have been made colonels of the 28th of November 1854?—Some of those colonels who were dated on the 28th of November 1854 had had but a very short service as lieutenant-colonels. My strong feeling is, that the remedy for the promotion of the lieutenant-colonels would have been, that when a three years' lieutenant-colonel came to be a colonel he should have pushed up his seniors.

923. (*Chairman.*) That would not have protected those who were lieutenant-colonels from the officers superseding them for distinguished service, that is also a new regulation?—It would not, it would neither have protected them from the promotion of aides-de-camp nor of distinguished service officers.

924. They had been always subject to the promotion of aides-de-camp?—Yes, always.

925. To the promotion of distinguished-service colonels they had not been subject, that was a new rule?—Yes; it might have been held to be a grievance at first, and so might the promotion of aides-de-camp have been held to be at first, but it has never been admitted to be so.

926. (*Maj.-Gen. Russell.*) I understand you to have drawn a distinction, as to the protection to be afforded to the lieutenant-colonels of June 1854, between the protection from the three years' rule and the protection from the distinguished-service colonels, why did you draw that distinction?—I think the one is a very high honour conferred by the Crown.

927. It was equally new to the army with the three years' service, was it not?—It was new to the army.

928. Your distinction, then, is simply on the ground of the prerogative of the Crown?—I think that is a fair distinction there.

929. (*Maj.-Gen. Rumley.*) Some stress has been laid, I think, in the minds of the public, upon the fact that no consideration whatever was shown by the Royal Commission of 1858 to the case of the officers promoted Queen's aides-de-camp and distinguished-service colonels. In the pamphlet which I hold in my hand, and which I see bears your signature, I read this paragraph, "The Commissioners of 1858, no doubt inadvertently, paid no consideration whatever to the cases of the officers, who, in 1855-56 had been specially selected by the Sovereign for distinguished service, or as Queen's aides-de-camp. There is not in the report even an allusion to them." Now, taking up the report, and reading paragraph 66, I find these words, "By distinguished conduct in the field the Commissioners of 1854 meant conduct so conspicuous as to justify a promotion so exceptional, and did not contemplate its application to the large number of officers, heads of departments, seniors of regimental ranks, &c., &c., to whom it has become customary to give a step by brevet, not only after general and even partial actions, but at the conclusion of military operations. Indeed, the granting of steps by brevet has had so little reference to individual service, that it has been held to be a slur on any officer occupying a certain rank or position to be omitted from the list." I should like to ask you whether, notwithstanding this paragraph in the proceedings of this Royal Commission, you think that their case has been overlooked?—I think the case of the aides-de-camp had been overlooked, but I wrote under the impression that all lieutenant-colonels promoted for distinguished service had been made Queen's aides-de-camp.

Vide Appendix, page 54.

930. You have mixed the distinguished service colonels with the aides-de-camp in your paragraph?—I ought to correct that, so far as to say that there has not been an allusion to the Queen's aides-de-camp.

931. I think you stated, in answer to a question just now, regarding the prerogative of the Queen, that it was very unusual to promote so large a number of officers at one time as was the case in promoting these officers, and antedating them to the 28th of November 1854; you answered that affirmatively, did you not?—Yes.

932. Was not it an unusual circumstance also to promote officers who had been lieutenant-colonels only five months to be Queen's aides-de-camp?—It was a prerogative of the Crown.

933. They are both prerogatives of the Crown. The former question preambled that it was the undoubted prerogative of the Crown to promote officers, and then asked whether it was not unusual to group so large a number together and antedate them, as was done, to the 28th of November 1854. In like manner I wish to put my question, preambling the undoubted prerogative of the Crown, whether it is not an unusual thing to promote officers to be Queen's aides-de-camp after only five months' service as lieutenant-colonels?—It was not a very usual thing, I admit;

but, although it was not usual with five months' service, it had been usual with short service to make an officer a colonel by making him an aide-de-camp.

934. Can you tell me the shortest service after which an officer has attained to that rank?—No, I could not without a very rigid examination of the Army List. I think the words "distinguished "service" should certainly be taken out of that paragraph of mine, as it was used with reference to the past.

935. (*Chairman.*) Then you do draw a distinction between Queen's aides-de-camp and officers promoted under the new warrant for distinguished service?—I am wrong in this paper in saying that there is no allusion whatever in the report of the Commission of 1858 to the officers promoted for distinguished service under the warrant of 1854. There is an allusion to it. I am decidedly wrong there.

936. (*Maj.-Gen. Rumley.*) Taking you on then to the Appendix to these proceedings of the Royal Commission of 1858, wherein the names of certain officers are given who had been promoted as aides-de-camp, and for distinguished conduct, let me ask, are the aides-de-camp not included and named in that list?—As I have said, I never saw this Appendix to the report.

937. But seeing it now, do they not appear to be distinguished there from others by a D prefixed to their names?—The D is put against those who are made Queen's aides-de-camp, and also against those promoted for distinguished service.

938. So that there is a distinction made in that list betwen them and other officers promoted?—Yes, but there is no distinction as to whether they were promoted as aides-de-camp or as distinguished-service officers, but there is simply a letter D in both cases.

939. Again I must come to this little memorandum of yours in which you say that "the Commissioners of "1858, no doubt inadvertently, paid no consideration "whatever to the cases of the officers, who, in 1855–"56 had been specially selected by the Sovereign for "distinguished service, or as Queen's aides-de-camp," whereas in that Appendix there is a letter D after their names?—As I say, I never saw this Appendix.

940. This pamplet was written when you had not seen that Appendix?—Yes; I still think that as the report does not say one word about the aides-de-camp, their cases were not considered by the Commissioners.

941. (*Maj.-Gen. Sandham.*) Do you refer to the warrant or to the report?—To the report of 1858.

942. (*Chairman.*) Having now seen the Appendix, you alter the opinion you expressed in that pamphlet, to this extent, that the case of the officers appointed Queen's aides-de-camp was not considered by that Commission, but that the case of the distinguished-service colonels was?—There is an allusion to the distinguished-service colonels, that is all I mean, in the 66th paragraph. That paragraph does not go to the length of any recommendation; it says, "By "distinguished conduct in the field, the Commissioners "of 1854 meant conduct so conspicuous as to justify a "promotion so exceptional;" I certainly overlooked that.

943. (*Maj.-Gen. Rumley.*) You overlooked that when you wrote your pamphlet?—I ought not to have said that there was no allusion whatever to distinguished conduct; my words are, "There is not in "the Report even an allusion to them," referring both to the Queen's aides-de-camp and to the officers selected for distinguished service. Now I find that there is an allusion to the latter class of officers, but it is only an allusion, and refers to the new rule of the warrant of 1854.

944. You say "It is much to be regretted that "what, with all respect for the Commissioners, must "be deemed the injudicious and unjust measure"?—I think it was an unjust measure myself "of giving to "every lieutenant-colonel commissioned prior to the "20th June 1854 his standing on the list of colonels "(whether he had been intermediately promoted or "not) according to his standing as lieutenant-colonel in "1854," because by that measure you prejudiced the eight Queen's aides-de-camp; that was in my particular view; I mean the Queen's aides-de-camp who had been previously promoted.

945. (*Maj.-Gen. Russell.*) Then you entirely disagree with the recommendation of the Commissioners of 1858; clause 34 in the report of that Commission says: "We think, therefore, that it is a matter "of regret that the interests of these officers were "not more unmistakeably guarded by extending the "special brevet then given to all the lieutenant-"colonels dating prior to the 20th June 1854. There "being no difference of pay between the ranks of "colonel and lieutenant-colonel, the extension would "have cost the public nothing"?—Yes, I cannot help thinking that the Commissioners of 1858 did not see what would be the effect of the promotion of every officer up to the 20th of June 1854, according to his date as a lieutenant-colonel. I have not the least objection to that promotion, but I think it was injudicious to place them in the rank which they held as lieutenant-colonels in 1854. Now, there is this curious fact about it, Colonel McMurdo was made an aide-de-camp long after Sir Thomas Troubridge, but he stands now a great deal above him.

946. He has resumed his original position which he held as lieutenant-colonel when Sir Thomas Troubridge was a major?—Yes.

947. (*Maj.-Gen. Rumley.*) He was the senior lieutenant-colonel?—Yes.

948. Had you any particular reason for the opinion which you expressed in your pamphlet, that in framing the 8th clause of the warrant Mr. Sidney Herbert took the wording of paragraph 125 without considering the strong recommendation of clause 52?—He has himself admitted it, as I understand.

949. To you?—No, not to me, but he has applied, as I understand, for some mode of rewarding those officers, having admitted his oversight.

950. It was nothing that took place in the office while you were superintending the correction of the warrant which leads you to say that?—No. I left in 1857, and the complaint was not investigated till 1858.

951. There is another little paragraph in your pamphlet: "The arrangement of 1858 has, in fact, "entirely cancelled the honour and reward of special "early promotion which Her Majesty intended to "confer upon the selected officers of 1855–56." It has not cancelled the honour, surely, of being an aide-de-camp?—It has cancelled the commission of a man, and taken away from him all advantage that was intended to be given him. Appendix, page 55.

952. It has not cancelled the honour, has it?—It has cancelled the reward.

953. You say "the honour" in your pamphlet?—I believe I may say that the position of an officer on the list is honourable.

954. You have stated that it has "cancelled the honour and the reward"?—It has cancelled the honour and reward, because it has deferred his promotion to the rank of major-general.

955. Surely the appointing these officers aides-de-camp, and leaving them in their present position, has taken them above several officers who were senior to them already?—It has unquestionably cancelled the reward of special early promotion, because those officers will not obtain promotion so early as they would if they had stood as they did in 1855.

956. I think you have admitted "that the protec-"tion promised by the Commissioners and by the "warrant was not afforded"?—Yes.

957. And you are of opinion that "there may be, "and there are probably, many difficulties in now "doing full justice to these distinguished officers, by "placing them in the places they ought to hold in "the list of colonels"?—Yes, I think there may be

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a difficulty, but I think that the right way would be to give them their position immediately after the officers who became, by three years' service, colonels before them.

958. (*Maj.-Gen. Russell.*) Do you include both Queen's aides-de-camp and the officers promoted as distinguished-service colonels?—I can hardly make a distinction myself.

959. The one is an old-established mode of promotion?—The one is an old-established custom and the other is a novelty, I admit, but I can hardly make a distinction, because it is an act of favour.

960. They having attained their present position on the list without prejudice to the colonels of 1854, have they not, under the new warrant, an opportunity of being selected for employment with increased rank; is not that another advantage which they enjoy under the new warrant, no matter what their position on the list of colonels may be?—The position which Sir Thomas Troubridge assumes on this list is, I think, the one which he ought to hold.

961. I speak of the class of officers consisting of aides-de-camp and distinguished-service colonels?—I only mentioned Sir Thomas Troubridge as the first aide-de-camp. I say that he and those appointed in May and June 1855 should stand before those who became by service colonels in July 1855.

962. Standing where they now do on the list, has not the Commander-in-Chief the authority granted by the new warrant to select those officers for employment with increased rank; is not that an advantage which they still possess. Any colonel on the list may be selected for employment with the rank of major-general, giving him the precedence of his senior colonels?—I think the Commander-in-Chief has that power.

963. Granted under the new warrant?—Granted under the new warrant. One of the matters I mentioned in the pamphlet is this: "The Commissioners "were, however, very regardful of the interests of "the colonels who had been promoted, for dis- "tinguished service, to be major-generals. They "were to be supernumeraries of their rank, until, by "regular succession as colonels, they were to come "on the fixed establishment of major-generals; but "they were from that time to take rank, not as last "on the list, but according to the dates of their "supernumerary commissions, with a view to earlier "promotion to lieutenant-general."

964. (*Maj.-Gen. Rumley.*) That does not answer the question, does it?—In this respect, it enables the Commander-in-Chief to place those officers as lieutenant-generals earlier than the colonels who were promoted as such before them.

965. (*Maj.-Gen. Russell.*) My question is, has not the power of selection conferred under the new warrant given the Commander-in-Chief the means, if he pleases to exercise it, to employ those officers in the rank of major-general at any time?—Yes, he has the power.

966. No matter what their position may be?—Yes, with the temporary rank of major-general, but with that only.

967. Which may be confirmed under certain conditions expressed in the warrant?—Yes.

968. (*Maj.-Gen. Rumley.*) That is one of the advantages which has not been cancelled; it is not one of the honours and rewards which have been cancelled?—No.

969. (*Maj.-Gen. Russell.*) With regard to being supernumerary on the list, is not there this difference between the major-generals' list and the colonels' list, that the one is a fixed establishment and the other has no limit?—There is that difference, the one is a fixed establishment and the other is not, but, by parity of reasoning, only the Queen's aides-de-camp who have been superseded by so many colonels should be treated in the same manner as the major-generals with temporary rank.

970. (*Maj.-Gen. Rumley.*) In paragraph 86 of the report of the Royal Commissioners of 1858, they say, "By an order dated the 1st of May "1855, it was announced that the rank of colonel "should be given to officers holding the rank of "brevet lieutenant-colonel for service in the field, so "soon as a period of six years of actual service should "have elapsed since their obtaining such brevet rank "or that they might have the option of a step of sub- "stantive unattached rank above their then regimental "rank, if the convenience of the service would "admit." Then there is a memorandum in the Appendix, dated War Office, May 1st 1855, which says, "Her Majesty has been graciously pleased to approve "of the rank of colonel being given to officers who "obtain the rank of brevet lieutenant-colonel for ser- "vices in the field after the period of six years' "actual service with that rank, and that they may at "once have the option of a step of substantive un- "attached rank where the convenience of the service "will admit of it?"—I know little of that memorandum, I might have read it, but I was at that time in the Secretary of State's office in Whitehall Gardens.

971. Were you aware of the terms of that warrant?—I did not pay any attention to those affairs at that period; I had quite enough to do with the Turkish contingent, and other levies and duties.

972. Were you aware of it at the time when you were considering the case of the distinguished-service colonels?—No, I was not.

The witness withdrew.

Adjourned.

REFORM CLUB PALL MALL

# APPENDIX.

MEMORANDUM handed in by

Major-General the Hon. JAS. LINDSAY.

THE claims of the officers promoted in 1855 as aides-de-camp to the Queen, and to the rank of colonel for distinguished service in the Crimea, are little understood by the public; they have been recently commented on by portions of the press, but the writers having been evidently misinformed as to the places these officers really seek, and the grounds on which they seek them as an act of justice and fair play, it has now been thought desirable to publish this statement and the accompanying lists.

In 1854 a Royal Commission recommended that the system of promotion to the rank of colonel should be altered:—

That lieutenant-colonels in command of regiments, and in certain staff appointments, should obtain the rank of colonel in three years; but that the existing interests of those already lieutenant-colonels before June 1854 should be carefully protected from injury.

The protecting clause was omitted in the Royal warrant; the effect of which was that the lieutenant-colonels who had served three years in a substantive capacity were promoted over those who were not so employed, such as those on half pay, or brevet lieutenant-colonels, or captains and lieutenant-colonels of the guards.

It was felt that the mode in which the new rule had been carried out was unjust to officers who had previous to its issue obtained the rank of lieutenant-colonel, and the Commission of 1858 was appointed to consider their case.

It is evident that if, when the rule was first promulgated, all existing lieutenant-colonels had been protected and placed upon an equal footing, and promoted to the rank of colonel after three years' service in the rank of lieutenant-colonel, none of them could have complained of the rule, or could by possibility have been injured by it.

The Commission of 1858, instead of proposing this mode of rectifying the injustice, from some misapprehension of the case, and unaware (as has been distinctly stated by the late Lord Herbert the president, and other members of the Commission) that the officers promoted in the interim by the Queen for service in the field in 1855 would be injuriously affected by their recommendation, proposed that all lieutenant-colonels previous to June 20th 1854 should be given the rank of colonel, antedating the rank to November 1854, the day on which the new three years' rule had first been acted upon.

The two methods would have been identical in their effect, if there had been no war in the interval, and no officers promoted for service in the field; but as these events occurred this difference has arisen.

By the first course—viz., promoting every lieutenant-colonel on the completion of three years' service—justice would have been done to the officers passed over under the "three years' clause," with the smallest amount of injury to the colonels specially promoted for service; whereas by the antedated brevet these officers have been seriously and unnecessarily injured, some of them having lost the whole of the advantages of their special promotion, and occupying now the same places they would have held had they remained at home instead of serving in the Russian war.

In the comments upon this subject which have appeared in print, many irrelevant topics have been introduced; such as the services in India in 1857 and 1858 of officers who would lose a few places by the proposed changes; the length of service of the colonels promoted in 1855, &c.

Sir Charles Yorke's Committee in 1861 reported against any disturbance of the list, but on reference to their report it will be seen that they did not argue the case on its merits or its justice, but based their recommendation on the grounds that the decision of a Royal Commission (that of 1858) should be final, whereas the Commission of 1858 was only convened for the purpose of reconsidering the decision of the Royal Commission of 1854.

The late Secretary for War, after a deliberate consideration of these claims, came to the conclusion that they were just, and by a letter, dated the 8th November 1862, he, with the concurrence of the Commander-in-Chief, decided the question in their favour. This was announced by the Under Secretary of State, to one of the officers concerned, on the 4th of January in the present year; since which time the concurrence adverted to has been withdrawn by a letter of the military secretary of 7th February 1863, no reasons having been assigned.

What is now asked for is the appointment of a Royal Commission to consider the claims of these colonels.

The accompanying lists show the exact places held by these officers up to November 1858, the places they now occupy, and the intermediate places claimed.

EXTRACT from ARMY LIST of OCTOBER 1858,

Showing the Positions occupied by the 21 Colonels in question before the antedated Brevet—they are denoted by asterisks.

Colonels who have since become non-effective are omitted.

COLONELS.

1854.

| | | |
|---|---|---|
| | Thos. Jas. Galloway, 70 F. | 28 Nov. |
| | William Jones, CB. 61 F. | do. |
| | Wm Burke Cuppage, R. Art. | do. |
| | Robert Burn, do. | do. |
| | J. MacDuff, 74 F. | do. |
| | T. Maitland Wilson, h.p. 96 F. | do. |
| | Geo. Staunton, 31 F. | do. |
| | C. Crutchley, Dep. Bn. at Birr | do. |
| | Cha Rochfort Scott, h.p. Staff Corps, Lt.-Gov. R. Mil. Coll. | do. |
| 10 | Mark Kerr Atherley, 92 F. | do. |
| | Trevor Chute, 70 F. | do. |
| | Wm. Gustavus Brown, 24 F. | do. |
| | Henry Jervis, Prov. Bn. at Chatham | do. |
| | M. Wm. Smith, 3 Dr. Gds. | do. |
| | J. Maxwell Perceval, CB. 12 F. | do. |
| | Henry W. Stisted, 78 F. | do. |
| | Philip M. N. Guy, 5 F. | do. |
| | Daniel Thorndike, R. Art. | do. |
| | Chas. Steuart, 14 Dr. | do. |
| 20 | John L. Dennis, 52 F. | do. |
| | Chas. Bertie Symons, R. Art. | do. |
| | Wm. O'Grady Haly, CB. 47 F. | do. |
| | Edmund Neal Wilford, R. Art. | do. |
| | Chas. H. Ellice, 24 F. | do. |
| | Henry R. Jones, 6 Dr. Gds. | do. |
| | Cha. Hegart, 7 Huss. | do. |
| | *John Garvock, Unatt. Ass. Qua. Mas. Gen. Ceylon* | 12 Dec. |
| | Thomas P. Flude, R. Art. | 30 do. |

1855.

| | | |
|---|---|---|
| | *Hon. A. Gordon, CB. Unatt. Dep. Qua. Gen.* | 6 Feb. |
| 30 | *Corbet Cotton, Unatt. s.* | 20 do. |
| | Alexander Tulloh, R. Art. | do. |
| | Hen. Geo. Teesdale, do. | do. |
| | James Creagh, 86 F. | 30 April. |
| | *Henry Bates, 98 F.* | 18 May. |
| | * Sir T. St. V. H. C. Troubridge, Bt. CB. h.p. 22 F., D. Adj. Gen., Aide-de-Camp to the Queen | do. |
| | Hon. H. H. M. Percy, Gr. Gds. Aide-de-Camp to the Queen | 29 June. |
| | T. M. Steele, CB. Coldst. Gds. Aide-de-Camp to the Queen | do. |
| | * Henry D. Griffith, CB. 2 Dr. Aide-de-Camp to the Queen | do. |
| | * Jas. W. Smith, CB. Unatt. *s.* Aide-de-Camp to the Queen | do. |
| 40 | * Hon. P. E. Herbert, CB. Unatt. *s.* Aide-de-Camp to the Queen | do. |
| | * Colling. Dickson, CB. R. Art. Aide-de-Camp to the Queen | do. |
| | * W. S. R. Norcott, CB. Dep. Bn. Aide-de-Camp to the Queen | do. |
| | * J. W. Gordon, CB. Dep. Adj. Gen. R. Eng., Aide-de-Camp to the Queen | do. |
| | F. Adams, CB. 28 F. | 16 July. |
| | *C. R. S. Lord West, CB. h.p. Dep. Bn. s.* | 17 do. |
| | *R. Wilbraham, CB. Unatt. s.* | do. |
| | * Art. Borton, CB. 9 F. | do. |
| | * C. A. Edwards, CB. 18 F. | do. |
| | * Dan. Lysons, CB. 25 F. | do. |
| 50 | * Hon. W. L. Pakenham, CB. Unatt. Ass. Adj. Gen. | do. |
| | J. R. Brunker, h.p. 15 F. Dep. Adj. Gen. | 24 Aug. |
| | *C. Tyrwhitt, Unatt. s.* | 31 do. |
| | *Wm. Irwin, Dep. Bn.* | 17 Sept. |
| | *F. Seymour, CB. Sco. F. Gds.* | 30 do. |
| | * H. S. Highness Prince W. A. E. of Saxe-Weimar, CB. Gr. Gds. | 5 Oct. |
| | * J. S. Brownrigg, CB. Unatt. | 2 Nov. |
| | * John St. George, CB. do. | do. |
| | * Edw. Charles Warde do. | do. |
| | * David E. Wood, CB. do. | do. |
| 60 | * J. Wm. Fitzmayer, CB. do. | do. |
| | * F. E. Chapman, CB. R. Eng. | do. |

| | |
|---|---|
| A. A. Shuttleworth, R. Art. | 7 Dec. |
| * W. M. S. M'Murdo, CB. Mil. Tr. Aide-de-Camp to the Queen | 11 do. |
| * E. R. Wetherall, CB. Unatt. Aide-de-Camp to the Queen, Dep. Q.M. Gen. E. Ind. | 11 Dec. |
| *Fred. P. Haines, Unatt. s.* | 18 do. |

1856.

| | |
|---|---|
| John Yorke, CB. Unatt. | 23 Mar. |
| *H. H. Graham, CB. 59 F.* | 29 April. |
| *Luke S. O'Connor, CB. 1 W. I. Reg.* | 1 May. |
| Henry Renny, 81 F. | 27 do. |
| 70 *John A. Lambert, Gr. Gds.* | 30 do. |
| * Hen. A. Lake, CB. Unatt. | 24 June. |

EXTRACT from ARMY LIST of APRIL 1863.

The Names of the Twenty-one Colonels in question are inserted and underlined in the places claimed, and denoted by Asterisks in the places in which they now stand. As the Army List now stands, all who became Lieutenant-Colonels before the 20th of June 1854 are full Colonels of November 28, 1854.

| | | Lieut.-Col. | Colonel. |
|---|---|---|---|
| | Thos. James Galloway | 22 Dec. 1848 | 28 Nov. 1854 |
| | *John Garvock* | do. | do. |
| | William Jones, *CB.* | 29 Dec. ,, | do. |
| W | Burke Cuppage | 8 Jan. 1849 | do. |
| | Robert Burn | 29 March ,, | do. |
| | *Hon. Alex. Gordon, CB.* | 10 April ,, | do. |
| | *Corbet Cotton* | 20 April ,, | do. |
| | *Matthew Smith* | 7 June ,, | do. |
| | *Henry Bates* | do. | do. |
| 10 | John MacDuff, CB. | 8 June ,, | do. |
| | Thos. Maitland Wilson | 15 June ,, | do. |
| | *Charles Tyrwhitt* | 6 July ,, | do. |
| | George Staunton | 20 July ,, | do. |
| | Charles Crutchley | 24 July ,, | do. |
| | Walter Hamilton, CB. | 2 Oct. ,, | do. |
| | Charles Rochfort Scott | 19 Oct. ,, | do. |
| | Mark Kerr Atherley | 23 Nov. ,, | do. |
| | Trevor Chute | 14 Dec. ,, | do. |
| | Wm. Gustavus Brown | 21 Dec. ,, | do. |
| 20 | Henry Jervis | 8 Mar. 1850 | do. |
| | Michael Wm. Smith, CB. | do. | do. |
| | J. Maxwell Perceval, CB. | 2 April ,, | do. |
| | Hen. Wm. Stisted, CB. | 19 April ,, | do. |
| | Philip M. N. Guy, CB. | 21 May ,, | do. |
| | Daniel Thorndike | 27 May ,, | do. |
| | *Francis Seymour, CB.* | 28 June ,, | do. |
| | Charles Steuart, CB. | 7 July ,, | do. |
| | John L. Dennis | 2 Aug. ,, | do. |
| | *Charles R. Sackville, Lord West, CB.* | do. | do. |
| 30 | *Fred. Paul Haines* | do. | do. |
| | *John Arthur Lumbert* | 15 Nov. ,, | do. |
| | Chas. Bertie Symons | 22 Dec. ,, | do. |
| | Wm. O'Grady Haly, CB. | 27 Dec. ,, | do. |
| | *Henry Phipps Raymond* | 17 Jan. 1851 | do. |
| W C | *Hon. Hy. A. Manvers Percy* | 7 Mar. ,, | do. |
| | *William C. E. Napier* | 30 May ,, | do. |
| | Edmund Neal Wilford | 6 June ,, | do. |
| | Chas. H. Ellice, CB. | 8 Aug. ,, | do. |
| | Hy. Richmond Jones, CB. | 16 Sept. ,, | do. |
| | *Thomas M. Biddulph* | 31 Oct. ,, | do. |
| | Charles Hagart, CB. | do. | do. |
| | *T. Montague Steele, CB.* | do. | do. |
| | *William Chambré* | 11 Nov. ,, | do. |
| | *Hon. Arthur C. Legge* | do. | do. |
| | *Melville Dalyell* | do. | do. |
| W | *John Birtwhistle* | do. | do. |
| | *James Creagh* | do. | do. |
| | *Hy. S. Stephens KH.* | do. | do. |
| | *Charles Barry* | do. | do. |
| | *James M'Queen* | do. | do. |
| W | *Samuel Waymouth* | do. | do. |
| | *Charles Smith* | do. | do. |
| | *Francis Westenra* | do. | do. |
| W | *Edgar Gibson* | do. | do. |
| | *Edward Last* | do. | do. |
| | *Francis Plunkett Dunne* | do. | do. |
| | *John Knight Jauncey* | do. | do. |
| | *Robert Shafto Vicars* | do. | do. |
| | *Rawdon J. P. Vassall* | do. | do. |
| 60 | *Jas. Pattoun Sparks, CB.* | do. | do. |
| | *Richard Chetwode* | do. | do. |
| | *John Parson Westropp* | do. | do. |
| | *George Marmaduke Reeves, CB.* | do. | do. |
| | *Edward Chas. Fletcher* | do. | do. |
| | *Edward Bagot* | 11 Nov. 1851 | 28 Nov. 1854 |
| | *James Scargill* | do. | do. |
| | *Robert Lewis* | do. | do. |
| | *Samuel Tryon* | do. | do. |
| | *Thomas Williams, CB.* | do. | do. |
| 70 | *Richard Wilbraham, CB.* | do. | do. |
| † | *William Irwin* | 26 Dec. 1851 | 26 Dec. 1854 |
| | Thomas P. Flude | 30 Dec. 1851 | 30 Dec. 1854 |
| | Alexander Tulloh | 1 April 1852 | 1 April 1855 |
| | Henry George Teesdale | do. | do. |
| | Sir T. Troubridge, Bart. CB. ADC. | 12 Dec. 1854 | 18 May 1855 |
| | H.D. Griffith, CB. ADC. | 27 Aug. 1852 | 29 June 1855 |
| | J. W. Smith, CB. ADC. | 24 Dec. 1852 | do. |
| | Hon. P. Herbert, CB. ADC. | 28 May 1853 | do. |
| W C | Col. Dickson, CB. ADC. | 20 June 1854 | do. |
| | S. R. Norcott. CB. ADC. | 12 Dec. 1854 | do. |
| | Frank Adams, CB. | 16 July 1852 | 16 July ,, |
| | A. Borton, C.B. | 10 June 1853 | 17 July ,, |
| | C. A. Edwards, CB. | 9 Dec. 1853 | do. |
| | D. Lysons, CB. | 21 Sept. 1854 | do. |
| | Earl of Longford KCB. | 12 Dec. 1854 | do. |
| | James Robert Brunker | 24 Aug. 1852 | 24 Aug. ,, |
| | HSH. Prince Edward of Saxe Weimar, CB. ADC. | 12 Dec. 1854 | 5 Oct. ,, |
| | J. S. Brownrigg, CB. | 13 Sept. 1853 | 2 Nov. ,, |
| | J. St. George, CB. | 17 Feb. 1854 | do. |
| | E. C. Warde, CB. | do. | do. |
| | Sir D. Wood, KCB. | 20 June 1854 | do. |
| | J. W. Fitzmayer, CB. | do. | do. |
| | * Henry Darby Griffith, CB. ADC. | 27 Aug. 1852 | 27 Aug. ,, |
| | Ashton Ashton Shuttleworth | 7 Dec. 1852 | 7 Dec. ,, |
| | W. M. S. McMurdo, CB. ADC. | 21 Oct. 1853 | 11 Dec. ,, |
| | E. R. Wetherall, CB. ADC. | 17 July 1855 | do. |
| | * James Webber Smith, CB. ADC. | 24 Dec. 1852 | 24 Dec. ,, |
| 80 | *Luke Smyth O'Connor, CB.* | 3 Feb. 1853 | 3 Feb. 1856 |
| | *F. Darley George, CB.* | 4 Feb. ,, | 4 Feb. ,, |
| | John Yorke, CB. | do. | do. |
| | *Henry Dunn O'Halloran* | do. | do. |
| | *J. Ham. E. Dalrymple* | 25 March ,, | 25 March ,, |
| | *Daniel Rainier* | 1 April ,, | 1 April ,, |
| | Henry Hope Graham, CB. | 29 April ,, | 29 April ,, |
| | Henry Renny | 27 May ,, | 27 May ,, |
| | George Campbell, CB. | do. | do. |
| | *Arthur Horne* | 28 May ,, | 28 May ,, |
| 90 | *John Jarvis Bissett* | do. | do. |
| | *John Armstrong* | do. | do. |
| | *Edw. Alan Holdich, CB.* | do. | do. |
| | *Robert Newton Phillips* | do. | do. |
| | *Sir Alfred H. Horsford, KCB.* | do. | do. |
| | *Walter D. P. Patton* | do. | do. |
| | *Geo. Jackson Carey* | do. | do. |
| | * Hon. Percy E. Herbert, CB. ADC. | do. | do. |
| | * Arthur Borton, CB. | 10 June ,, | 10 June ,, |
| | *David Elliot Mackirdy* | 25 Aug. ,, | 25 Aug. ,, |
| | H. A. Lake, CB. ADC. | 9 Feb. 1855 | 12 Sept. 1856 |
| 100 | * John Studholme Brownrigg, CB. | 13 Sept. 1853 | 13 Sept. 1856 |
| | * William Montague S. McMurdo, CB. ADC. | 21 Oct. ,, | 21 Oct. ,, |
| | *William Munro, CB.* | 11 Nov. ,, | 11 Nov. ,, |
| | *Arnold Charles Errington* | 9 Dec. ,, | 9 Dec. ,, |
| | * Clement Alex. Edwards, CB. | do. | do. |
| | *Sam. Tolfrey Christie, CB.* | do. | do. |
| | *William Mark Wood* | 13 Dec. ,, | 13 Dec. ,, |
| | Henry Smyth, CB. | 30 Dec. ,, | 30 Dec. ,, |
| | *Lord Mark Kerr, CB.* | | |
| | *John McCoy* | 24 Jan. 1854 | 24 Jan. 1857 |
| 110 | Henry W. Whitefeild | 3 Feb. ,, | 3 Feb. ,, |
| | John Wilkie | 10 Feb. ,, | 10 Feb. ,, |

† The dates, from Colonel Irwin downwards, are given on the completion of three years' service as Lieut-Colonel, thus affording full protection from the three years' clause of the Warrant of Oct. 1854.

| | | Lieut.-Col. | Colonel. |
|---|---|---|---|
| | Henry Servanté | 17 Feb. 1854 | 17 Feb. 1857 |
| | Henry O. Crawley | do. | do. |
| | John Twiss | do. | do. |
| | *Edward Frome* | do. | do. |
| | Charles Edmund Wilkinson | do. | do. |
| | *Robert Fitzgerald Crawford* | do. | do. |
| | * John St. George, CB. | do. | do. |
| | *Wm. Rob. Nedham* | do. | do. |
| 120 | * Edw. Charles Warde, CB. | do. | do. |
| | *H. Percival de Bathe* | do. | do. |
| | Richard Waddy, CB. | 3 Mar. ,, | 3 Mar. ,, |
| | John William Ormsby | 17 Mar. ,, | 17 Mar. ,, |
| | William Turnbull Renwick | 21 Mar. ,, | 21 Mar. ,, |
| | *Thos. Holmes Tidy* | 28 Mar. ,, | 28 Mar. ,, |
| | Edmund Haythorne | 12 May ,, | 12 May ,, |
| | Thomas Brooke | 19 May ,, | 19 May ,, |
| | Arthur Joseph Taylor | 30 May ,, | 30 May ,, |
| | Henry Dalrymple White, CB. | 1 June ,, | 1 June ,, |
| 130 | * Sir T. St. V. H. C. Troubridge, Bart., CB. ADC. | 12 Dec. ,, | 18 May 1855 |
| VC | * Collingwood Dickson, CB. ADC. | 20 June ,, | 29 June ,, |
| | * W. Sherbrook Ramsey Norcott, CB. ADC. | 12 Dec. ,, | do. |
| | * John Wm. Gordon, CB. ADC. | 24 April 1855 | 29 June ,, |
| | * Daniel Lysons, CB. | 21 Sept. 1854 | 17 July ,, |
| | * Wm. Lygon, Earl of Longford, KCB. | 12 Dec. ,, | do. |
| | * HSH. Prince W. A. E. of Saxe Weimar, CB. ADC. | do. | do. |
| | * Sir David E. Wood, KCB. | 20 June ,, | 2 Nov. ,, |
| | * James Wm. Fitzmayer, CB. | do. | do. |
| | * Fred. E. Chapman, CB. | 24 April 1855 | do. |
| 140 | * Edw. Robt. Wetherall, CB. ADC. | 17 July ,, | 11 Dec. ,, |
| | * H. A. Lake, CB. ADC. | 9 Feb. 1855 | 12 Sept. 1856 |

ENGINEERS.

| Major-Generals. | Lieut.-Col. | Colonel. | Maj.-Gens. |
|---|---|---|---|
| J. W. Gordon, CB. ADC. | 24 April 1855 | 29 June 1855 | 3 April 1862 |
| F. E. Chapman, CB. | 24 April ,, | 2 Nov. ,, | April 1863 |
| B. Spicer Stehelin, R.E. | 19 Sep. 1853 | 19 Sep. 1856 | 3 April 1862 |
| John Walpole, R.E. | 17 Feb. ,, | 17 Feb. ,, | April 1863 |

Colonels Gordon and Chapman, having been specially promoted to the rank of colonel in 1855, ought to have been promoted to the rank of major-general on the two last vacancies instead of Colonels Stehelin and Walpole, who had not completed three years' service as lieutenant-colonels till 1856, as shown above.

NOTE.—The officers whose names are printed in italics are those who were passed over under the three years' clause, and who in 1858 were the only complainants. In the first list only four of these stand above Sir Thomas Troubridge; in the second list 71; the difference is 66, of which it is admitted that 40 (down to Col. Irwin) have a fair claim to be colonels of dates *prior to the 18th May* 1855, and therefore to stand before Sir Thomas Troubridge; but at present 26 complainants, who only asked for their former *relative* positions with reference to the three years' clause, and many other colonels, from Adams to White inclusive, also stand before him and they have no claim to be colonels before the Queen's aides-de-camp, and colonels promoted for distinguished service, were selected.

JAS. LINDSAY, Major-General.

## Mr. CROOMES' MEMORANDA handed in by Colonel Sir THOMAS TROUBRIDGE, Bart.

MY DEAR SIR, Henley, 12 November, 1861.

AFTER reading carefully the papers you sent me, I felt it a duty to state, in my own way (inflicting upon you the prolix tediousness of an old man), what appeared to me important to prove the wrong which you and the other distinguished officers sustained by the warrant of 1858. I think, with you, that Mr. Sidney Herbert, in framing the warrant of 1854, looked principally at the summing up at the end of the Report, without sufficiently considering the protection promised by the 52nd clause.

The Commissioners of 1858 have misconstrued the words "general brevet," as an intention on the part of the Commissioners of 1854 to promote every lieutenant-colonel of, and prior to, the 19th June, 1854; but the intention of that Commission is to be found in the proceedings which were immediately adopted by the two official members of the Commission, Lord Hardinge and Mr. Sidney Herbert, by the grant of an immediate brevet, not for all, but for such portion only of the then existing lieutenant-colonels as they thought were justly entitled to such immediate promotion. The warrant subsequently promulgated promised brevet promotion for the remaining field officers, but unfortunately without pointing out the manner in which, by such brevet, the interests of the remaining lieutenant-colonels were to be protected by promotion when a junior was to be passed up.

If the Commissioners had intended the general brevet to include every recently appointed lieutenant-colonel then existing, the Commander-in-Chief and Secretary-at-War would have been bound to carry out the intention of the Commissioners to the full extent, and in that case you and your companion aides-de-camp would have had no cause of complaint; but this was not done, and very properly, as the remaining regimental lieutenant-colonels were required to establish their claims to promotion by three years' full-pay service in command.

The warrant which prescribed such service promised also brevet promotion, and at the same time admitted the right of the Crown to promote specially, by selection, as Queen's aide-de-camp, or for distinguished service in the field.

You and your companions so specially promoted,† have sustained an undoubted injury by loss of position, under the indiscriminate promotion by antedate made in 1858.

By the pamphlet sent to me, you seem to admit the justice of the promotions which ought to have taken place whenever a lieutenant-colonel by service had, before your appointments, passed over his senior officers; and this, I think, was the real protection which the Commissioners of 1854 intended, and which it is to be regretted was not carried out from time to time.

Sincerely yours,

Sir Thomas Troubridge, Bart. JOHN CROOMES.

12 November 1861.

The Commissioners of 1854, with a view of securing for the future a more efficient list of general officers, proposed that all lieutenant-colonels who had served a certain period in command of their regiments or on the staff should have the rank of colonel, and that from and after the 20th June 1854, general brevets should be abolished.

The 52nd clause of the Report is that showing most clearly the views of the Commissioners.

They said:—"We are however aware that if this system "were at once substituted for that which has been hitherto "in force, without adopting some means to protect the "interest of those whose prospects would be affected by the "change, much injustice would be inflicted on many officers "who have relied on the continuance of the present regula-"tion" (viz., promotion by seniority, but by uncertain periodical brevets). "We are of opinion that a liberal view "ought to be taken of the claims of those officers, and that "in introducing the change which the public good requires, "they ought to be carefully protected from injury, and from "having their *just expectations** di sappointed.

"We would therefore humbly recommend to your "Majesty that before our suggestions are adopted, a general "brevet should be granted, and also that the regulations we "have proposed, limiting the advancement of lieutenant-"colonels to the rank of colonel to those only who have "served three years in command of a regiment or in staff "situations, as already described, should not apply to "existing lieutenant-colonels, or majors, or captains, "lieutenant-colonels of the guards."

The 125th clause briefly sums up the recommendations of the Commissioners, thus:—

1st. That officers actually serving with the rank of lieutenant-colonel in command of, or as second lieutenant-colonel of regiments, as mounted officers of the guards, field-officers of the Royal artillery and engineers, or on the staff in situations necessarily held by lieutenant-colonels for three years, be given the rank of full colonel.

2nd. That existing field officers be allowed to rise *by brevet as under the regulations now in force*, but no

* These just expectations will be noticed.

† The words, "*before any brevet took place*," omitted at request of Mr. Croomes.

officer not now in the rank of field officer to rise from the rank of lieutenant-colonel, otherwise than by three years' service in the former rank, or *as a reward for distinguished service, or, as now, by appointment as Queen's aide-de-camp.*

It is now necessary to state what were the *just expectations* of the then existing lieutenant-colonels. They looked for promotion by absolute seniority, as they then stood on the list, whenever it was thought expedient to grant the brevet. This was a just expectation, but in my experience it had not been the practice that every lieutenant-colonel, however recently promoted to that rank, should expect almost immediate promotion.

They had relied on the continuance of the then existing regulation, which usually left them a few years in the rank of lieutenant-colonel, not liable to be superseded by their juniors, except in the case of officers selected by the Crown as Queen's aide-de-camp, or* of officers specially promoted for distinguished services.

The only protection they required was that their juniors, when by three years' service they had obtained the rank of colonel, should not pass over them; and if the just principle had obtained of promoting all above the newly promoted colonel, he being the last on the list, no complaint could have arisen.

I now refer to the construction placed upon the report of 1854, by the chairman of that Commission, who as Secretary-at-War, prepared the warrant of 1854.

The report of the Commissioners was dated the 17th of June 1854. On the 20th June 1854, it was notified to the army, that all officers appointed lieutenant-colonels on or after that date must serve three years upon prescribed full-pay to obtain promotion as colonel, and that general brevets were for them prospectively abolished.

On the 20th June 1854, a brevet promoted all the lieutenant-colonels who under the existing brevet system had a just expectation of such promotion, but left those of more recent date to be dealt with as circumstances might arise.

It is therefore quite clear to my mind that Lord Hardinge, the Commander-in-Chief, and Mr. Sidney Herbert, both members of the Commission, considered that they thereby fully carried out the views of the Commissioners as to the general brevet recommended.

By the 8th clause of the warrant subsequently promulgated, it is stated that "field-officers commissioned as such before the 20th June 1854," (the brevet of the 20th June having disposed of every lieutenant-colonel, who at that time had a fair claim to be colonel,) "be allowed to rise by brevet as under the regulations then in force, viz. occasional periodical brevets; but no officer promoted to the rank of field-officer on or after that date is to rise from the rank of lieutenant-colonel to that of colonel otherwise than by three years' service in the former rank, or as a reward for distinguished service, or by appointment to be Queen's aide-de-camp."

It is within my knowledge that Mr. Sidney Herbert himself prepared the first 14 clauses of the warrant, and I am of opinion that in framing the 8th clause he took the wording of the paragraph of the 125th without considering the strong recommendation of the 52nd clause of the report, that the interests of the then existing lieutenant-colonels should be protected. The warrant merely says they were to be allowed to rise by brevet as under the existing regulations then in force, but the 52nd clause of the report, which I here repeat, says, "We are of opinion that a liberal view ough "to be taken of the claims of these officers, and that in introducing the change which the public good requires, they "ought to be carefully protected from injury and from having "their just expectations disappointed."

The warrant promised them future brevet promotion (all the lieutenant-colonels then considered entitled by Lord Hardinge and Mr. Sidney Herbert having been promoted on the 20th June 1854), but no brevet took place, and no protection for the injury they suffered by many supersessions was afforded.

The absorbing events of 1854, 1855, and 1856 diverted the attention of the Commander-in-Chief and Secretary-at-War, from the disappointment which so many lieutenant-colonels had suffered, but even the warrant had promised them future brevet promotion, and I know that Mr. Sidney Herbert subsequently felt the injustice they had sustained, and that he advocated that whenever a lieutenant-colonel had, by three years' service, obtained under the new warrant, a right to promotion, all his senior lieutenant-colonels should be promoted before him, either with the same date or with an antedate. This would have injured nobody. The lieutenant-colonel who by service had obtained promotion, would have benefited himself without injuring his seniors, and thus gradually the list of lieutenant-colonels existing on the 20th June 1854 would have been absorbed in the rank of colonel.

If in 1854 every lieutenant-colonel had been made a colonel, including those serving with their regiments, the three years' service required for promotion would have been a mere fiction as far as they were concerned.

Nothing, however, having been done from 1854 to protect the interest of these superseded officers, their complaints of the loss of their position were forced upon the notice of the authorities, and in 1858 a further Commission was appointed to investigate their grievances.

By the report of that Commission, it appears that the cases of the colonels who had been promoted for distinguished service, to be major-generals, were first considered. There is a pecuniary advantage in the promotion from colonel to major-general, but there is also a prospective advantage in advancement in rank according to the date of such promotion. Promotion to rank of colonel gives no immediate pecuniary advantage, but by the date of colonelcy it secures promotion to the rank of major-general, with its pecuniary advantage and future progress in rank.

The Commissioners of 1858 recommended that the colonels who had been promoted to be major-generals for distinguished service should be supernumerary to the list of major-generals, until, by the regular succession according to their dates as colonels, they should in their turn come upon the fixed list of major-generals, at which period they should take their rank in the list, according to the dates of their original appointments as supernumeraries, and thus become lieutenant-generals, before those who were placed upon the fixed general officers' list whilst they were supernumerary.

By this the pay of general officer is secured from the date of appointment as supernumerary major-general, but the right of promotion to the rank of lieutenant-general is reserved to him according to the date of his first appointment as a supernumerary major-general.

In looking at the injuries inflicted upon certain lieutenant-colonels by the operation of the warrant of 1854, they recommend the simple but wholesale measure of placing on the list of colonels, every colonel and lieutenant-colonel whose commission as lieutenant-colonel was dated before the 20th June 1854, in the order in which they stood as lieutenant-colonels on that day.

It may be fairly assumed as certain that the commissioners of 1854 did not, by recommending a general brevet, contemplate so sweeping a measure.

This may be fairly inferred from the extensive brevet made by the joint concurrence of Lord Hardinge and Mr. Sidney Herbert, the most influential members (from their official position) of the Commission, and from the warrant of 1854 having promised brevet promotion to those lieutenant-colonels who then remained on the list of lieutenant-colonels with commission dated prior to the 20th June 1854.

It is much to be regretted that what, with all respect for the Commissioners, must be deemed the injudicious and unjust measure of giving to every lieutenant-colonel commissioned prior to the 20th June 1854, his standing on the list of colonels (whether he had been intermediately promoted or not) according to his standing as lieutenant-colonel in 1854, was recommended and adopted.

The Commissioners of 1858, no doubt inadvertently, paid no consideration whatever to the cases of the officers, who, in 1855–56, had been specially selected by the Sovereign for distinguished service, or as Queen's aides-de-camp.* There is not in the Report even an allusion to them. It may therefore be fairly assumed that they and their interests were entirely overlooked.

The prerogative of the Crown to select such officers for special promotion, is not disputed. Individual officers may, by having been superseded, have felt such selections as a personal grievance; but no instance has, I believe, occurred, of having all the officers whom the selected officer passed over, placed by a subsequent act above him on the list by an antedate of their commissions.

The injured lieutenant-colonels had no right to complain, and did not complain, that the Queen, in the undoubted exercise of her authority, had specially honoured and rewarded certain officers; but they did complain, and with justice, that they had been passed over by their juniors, under a warrant, which, while it established a new rule of promotion, promised them protection, but had not afforded it to them.

The Commissioners of 1858 could have repaired this wrong, without at the same time ruining the prospects of Sir Thomas Troubridge and others. When these officers

* Corrected by Mr. Croomes in his evidence before the Commissioners —Answer to Question 934.

* Corrected by Mr. Croomes in his evidence before the Commissioners —Answers to Questions 929 to 943.

were so honourably selected, the warrant had only injured a few of the lieutenant-colonels, but all the lieutenant-colonels of 1854 are now placed on the list before the selected officers by a general antedate.

The arrangement of 1858 has, in fact, entirely cancelled the honour and reward of special early promotion which Her Majesty intended to confer upon the selected officers of 1855, 1856, and has, I submit, in their case, interfered with the prerogative of the Crown.

As the Commissioners of 1858 had not foreseen the effect of their proposal upon Her Majesty's aides-de-camp, it may be fairly assumed that the Secretary of State for War had, in like manner, overlooked it. But this sweeping universal measure of placing every lieutenant-colonel of, and prior to, 19th June 1854, on the list of colonels, as they stood on the list of lieutenant-colonels on that day, has so deteriorated the position of Her Majesty's aides-de-camp, &c. &c., that I feel persuaded that if this effect had been explained or known to Her Majesty, her sense of justice and regard for her prerogative would have induced her to withhold her approval.

I have endeavoured, and I hope satisfactorily, to prove that the Commission of 1854, and the warrant consequent upon it, did not contemplate an immediate and indiscriminate promotion of every lieutenant-colonel then commissioned, some of whom had only in that year obtained their rank of lieutenant-colonel; but that ample justice was, at the time, done to the then existing lieutenant-colonels by the brevet promotion, which, in the opinion of Lord Hardinge and Mr. Sidney Herbert, was all that was required.

These public officers had but recently returned from the discussions of the Commissioners, and must be presumed to have acted according to the views of the Commissioners generally.

By the warrant of 1854, there was a promise of brevet promotion for the remaining lieutenant-colonels.

That the protection promised by the Commissioners and by the warrant was not afforded, is admitted; and this was the grievance of the lieutenant-colonels.

Although it might be argued that the Queen's aides-de-camp, &c., appointed colonels after the warrant of 1854, had at that time an undoubted right to expect that they might, from time to time, retain the position on the list of colonels, to which they were then appointed (the warrant of 1854 distinctly recognizing the right of such selection), there had been, by the neglect of the authorities, a want of consideration for the interest of the unemployed lieutenant-colonels who had been promised the protection of occasional brevets, by not promoting those who were senior to a lieutenant-colonel, who, by the prescribed full-pay service, had obtained the rank of colonel.

It would, therefore, be but a mere act of justice on the part of the selected colonels, to admit the claims of all those lieutenant-colonels who ought to have been, but were not, advanced in rank when their juniors, by the new regulation, superseded them, the promised brevet promotion not having taken place. This concession, for all who ought to have been promoted before their own selection, I infer from the pamphlet sent to me, the selected officers are willing, and I think fairly, to yield; but they appeal with great justice against the indiscriminate promotion of every lieutenant-colonel of June 1854, by an antedate, which entirely destroys the honour and the advantages (prospectively) which the Queen intended to confer.

It was deemed difficult to repair a wrong inflicted upon certain lieutenant-colonels, by the promotion of their juniors over their heads, but although the injury had continued under a Royal warrant (by the neglect of the authorities to afford them that protection which the warrant sanctioned), it was not considered inexpedient, after three years, to repair that injury; but in so doing, a very serious injustice was inflicted upon very distinguished officers honourably selected by Her Majesty, whose prospective views are materially prejudiced. Equal justice requires that this injury should be repaired.

There may be, and there are probably, many difficulties in now doing full justice to these distinguished officers, by placing them in the places they ought to hold in the list of colonels.

The Commissioners of 1858 said that the promotion of lieutenant-colonels, to be colonels, cost the public nothing, and without any reference to the position of the Queen's aides-de camp, promoted the whole of the lieutenant-colonels of June 1854; but instead of giving to each a date when the promotion of their juniors, by three years' service, had entitled them, under the warrant, to be protected by anterior or brevet promotion (as promised), they made every lieutenant-colonel of 1854 a colonel, with a four-years' antedate. This, by an oversight, or by a wrong construction of the intentions of the Commission of 1854, is the source of the injury to the aides-de-camp.

The Commissioners were, however, very regardful of the interests of the colonels who had been promoted, for distinguished service, to be major-generals. They were to be supernumeraries of their rank, until, by regular succession as colonels, they were to come on the fixed establishment of major-generals; but they were from that time to take rank, not as last on the list, but according to the dates of their supernumerary commissions, with a view to earlier promotion to lieutenant-general.

By parity of reasoning, Her Majesty's aides-de-camp should (if not replaced on the list, as they ought to be, and as they stood for three years) be placed, with reference to future promotion, immediately after those colonels who obtained their rank before them, and by so doing, breveted, or ought to have breveted, their senior lieutenant-colonels.

This would secure the promotion of all those appointed in May and June 1855, before Colonel Adams, who became colonel by service on 16th July; those appointed on the 17th July, before Colonel Brunker, who qualified on 24th August; and so on through the list, but this would be but a slight compensation for the loss of position they held until the warrant of 1858.

JOHN CROOMES,
Late Chief Clerk, War Office.

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## STATEMENT of
## Colonel Sir THOMAS TROUBRIDGE, Bart.
## (Received 25 May 1863.)

In the report of the Royal Commission of 1854 a new rule of promotion to the rank of colonel was recommended for adoption in lieu of the old system of periodical brevets, viz., that all lieutenant-colonels should in future rise by service alone—by three years' service in certain qualifying situations. It was, however, felt that the existing interests of field officers who had purchased or obtained their promotion subject to no such restriction "ought to be carefully "protected from injury," and it was therefore recommended that a general brevet should be granted which would remove from the possibility of injury many of the senior lieutenant-colonels then on the list; and, moreover, that the proposed new rule "should not apply to existing lieutenant-colonels, &c."

Report of 1854, par. 42.

Par. 52.

Brevet of 20th June 1854, including lt.-cols. of 1846.
Par. 52.

This distinct recommendation was, however, not carried out. The report was signed 17th June 1854, but no warrant appeared until the 6th October 1854. The news of the battle of the Alma received in the latter part of September rendered it desirable that the proposed system, under which younger colonels would be available, should be introduced at once. Mr. Ramsay, secretary to the Commission of 1854, has stated that Lord Hardinge was most anxious for the appearance of the warrant, and pressed the Secretary at War (the late Lord Herbert) to prepare it as soon as possible. Mr. Croomes, late chief clerk at the War Office, states that the first 14 clauses of the warrant were prepared by Lord Herbert himself; the 7th and 8th clauses introduce the new system, but all mention of protection to existing interests is omitted. On reference to the report of 1854 the accident to which this omission is due becomes apparent. In the latter part of par. 124 it is said, "We now proceed shortly to re-"capitualte the whole of the recommendations, &c" Sections 1 and 2 of par. 125 recapitulate the recommendation of the three years system, but omit all reference to the detail of protection to existing interests which is given in par. 52 in the body of the report; now, on comparing clause 8 of the warrant with section 2 of par. 125 of the report, it is evident that the clause was copied from the summary and that protection was thus accidentally omitted. It is a matter of regret that this omission was not observed at the time, as the injustice to non-qualified lieutenant-colonels would probably have been prevented; this commenced with the promotion of 28 November 1854, under the 7th clause of the warrant, in which promotion 27 lieutenant-colonels, from Garvock to Wilbraham, were passed over, and the system was continued until November 1858, by which time 115 lieutenant-colonels had been passed over as non-qualified.

Memo of Mr. Croomes, page 54.

Warrant of 6 Oct. 1854.

Page 43 of Appendix to Report of 1858.

Had the proposed protection been given in the warrant, no revision of the list in 1858 would have been necessary; and, with reference to the case under discussion, it is evident that the 21 colonels specially promoted in 1855 and 1856 would have fallen into the very places now claimed for them. Colonel Wilbraham would have been included in the promotion of 28 November 1854, because although not then "qualified," he would have been *protected*, having completed three years' service as lieutenant-colonel on the 11th November 1854. Colonels Irwin and Flude having completed three years service in December would have been

next promoted; Colonels Tulloh and Teesdale would have been in like manner promoted in April, and when on the 18th of May 1855 it pleased Her Majesty to appoint Sir T. Troubridge her A.D.C., that officer would have taken his place as colonel at the bottom of the list next below Teesdale. The next promotions were those of five officers appointed aides-de-camp to the Queen on the 29th of June; then Colonel Adams having completed three years' service as lieutenant-colonel on the 16th July 1855 would have followed, and so on.

See extract from Army List in Appendix, p.52. See table, appendix 14, page 51 of report of 1858.

Having thus shown the real error of 1854, viz., the omission of protection in the warrant, the next step is to examine the report of the Royal Commissioners of 1858. We here find that they endeavoured, in accordance with the spirit of their instructions, "to report what measures are necessary "to neutralize the effect of any hardships" resulting from the changes of 1854. It would appear, however, that the Commissioners did not exactly apprehend the nature of the error of 1854; the subject is mentioned at par. 28 of their report, but from the latter part of the par. they seem to have been of opinion that some amount of passing over was contemplated, whereas, on the contrary, the recommendation of protection in the report of 1854 is most distinct and unqualified, and was not met by clause 8 of the warrant. The Commissioners of 1858 do not refer to the above recommendation, but appear to have conceived the idea that the whole of the lieutenant-colonels on the list prior to 20 June, 1854, ought to have been at once made full colonels; they "think it therefore a matter of regret" that this was not done, and in par. 48 recommend that this wholesale promotion should be given retrospectively by a brevet ante-dated to 28 November 1854, the date of the first promotions under the new rule.

Report of 1858, par. 3.

Warrant of 1854, clause 8.

Report of 1858, par. 34.

It is by this recommendation, which was carried out in the warrant of October 1858, that the 21 colonels specially promoted in 1855 and 1856 have been injured; of these officers ten were lieutenant-colonels prior to 20th June 1854, and have fallen back to the same places which they occupied before the war; the remaining 11 not having obtained their lieutenant-colonelcies until on or after the 20th June, 1854, (three of the number on that very day), have been turned down to the bottom of all those officers who were lieutenant-colonels prior to that date, because they have retained the dates of their special promotions as colonel in 1855 and 1856, while the lieutenant-colonels up to 20th June have all been by the antedated brevet made colonels of 28 November 1854. Of these officers thus antedated many had a fair claim to be restored to their former positions, viz., those who had been passed over up to the dates of the special promotions, but the antedated brevet has indiscriminately put up all who were passed over up to November 1858, and not them only, but many others, from Adams to White, who had not been passed over at all, and were not complainants in any way.

Printed extracts from Army List, in Appendix, page 52.

This antedated brevet having been proposed on the grounds that the Commissioners of 1854 ought to have then recommended the immediate promotion of all the lieutenant-colonels then on the list, it may fairly be considered whether it is probable that they would have proposed such a measure had the idea occurred to them, of which there is no trace in their report. They concluded their proceedings early in June 1854, and, had it been then proposed to promote all the lieutenant-colonels on the list down to Lieutenant-Colonel White, who only obtained his lieutenant-colonelcy on the 1st June, it would surely have been said, Why should this officer be promoted now? he cannot possibly be injured by the new three years' rule until after the 1st of June 1857, because no junior lieutenant-colonel can until then be qualified for promotion; it will, therefore, be time enough to promote him on that day, or as soon after as he may be in danger, in the event of any junior lieutenant-colonel becoming "qualified" before him; but this is provided for if the spirit of our recommendation is attended to, for we say in par. 52 that his "interests should be carefully protected." However that may be, the fact remains that no such recommendation was made or discussed, and it may fairly be questioned if the Commissioners in 1858 were justified in proposing a retrospective measure of so sweeping a nature, to the injury of interests such as those of the 21 colonels specially promoted in the interim under different regulations.

Par. 52 and 53 of Report of 1854.

This would appear the place to consider whether the effect of the antedated brevet on the 21 colonels was clearly foreseen.

In the 2d par. of the report (dated 10 July 1858) it is said "we thought it best to decline to receive oral evidence." It appears, however, that on the 28th April minutes were taken of the evidence of Major-General the Honourable Jas. Lindsay, and extracts of this evidence were recently read in the House of Commons by the Under-Secretary of State for War, with a view to show that the cases of the 21 colonels had been considered.

Report of 1858, par. 2.

Referring to these minutes of evidence it appears that two of the members were absent, viz., Lord Panmure and Sir Jas. Scarlett, and of those present, the chairman (the late Lord Herbert) and two military members, Sir F. Smith and Sir F. Williams, have stated that they did not understand that the interests of any officer specially promoted would be affected. The evidence bears out this view. In question 71 General Lindsay is asked by the chairman whether by his suggestion (67) he would get all the 115 officers passed over to stand in the same relation to one another just as if the warrant (6 Oct. 1854, clause 8) had never been in operation. His reply is "No doubt of it, but the officers promoted for distinguished service" (the 21 colonels now in question) "will occasionally intersect their dates." The chairman evidently not understanding General Lindsay's reply, says (73) "Take a higher case, Colonel Inglis was made a major-general, &c."

Appendix 1 page 45, of Report of 1858.

And again, in 76 and 77, it is clear that the point in question was not really understood.

In reply to question 78, it is unfortunate that it did not occur to General Lindsay to mention that 11 of the officers he alluded to were promoted to colonel on appointment as aides-de-camp to the Queen under a rule of long standing, and not under the 13th clause of the warrant of October 1854.

It will be observed that no mention whatever is made of Queen's aides-de-camp, either in this evidence or in the report.

It will be well in this place to point out the difference between the claims of the 11 Queen's aides-de camp and of the 10 colonels promoted under the 13th clause of the warrant of October 1854. As regards the first, the lieutenant-colonels of dates prior to 20 June 1854 could not claim protection against any such legitimate exercise of the Queen's prerogative, and consequently were not entitled to have such protection awarded them retrospectively as was given by the antedated brevet. Colonel White, a lieutenant-colonel of June 1854, might fairly have said, when the warrant of October was published, I claim protection against the new three years' clause, and I shall be fully protected if promoted on the 1st June 1857. I also claim not to have any junior lieutenant-colonel put over me under the 13th clause of the warrant, because that also is a new regulation; but he could not possibly have claimed protection up to June 1857 against the appointment of Queen's aides-de-camp, because he obtained his lieutenant-colonelcy with the knowledge that he was at any time liable to be passed over by them. Consequently, as regards the colonels, from Adams to White, they cannot complain of the promotion over their heads of 10 Queen's aides-de-camp, appointed before they had served three years as lieutenant-colonels.

With respect to the 10 colonels promoted under the warrant of 1854 the case would stand thus:—

In 1854 a new rule was introduced enabling promotion by selection to be given for distinguished service, both to colonels and to lieutenant-colonels. Under this rule several officers were promoted in 1855. Three years afterwards the rule was brought under the consideration of the Royal Commission of 1858, in which year seven officers, promoted by selection from colonel, were on the generals' list as supernumerary major-generals, and 10 promoted by selection from lieutenant-colonel were high up on the colonels' list. The Commissioners of 1858 recommended that the major-generals should retain the places to which they were promoted, and that the extra expense, above the fixed establishment, of their pay as major-generals, should fall on *the public* until they became absorbed. Had the case of the 10 colonels been considered, it is more than probable that a similar arrangement would have been proposed on their behalf. It would have been said these 10 officers were considered deserving of special promotion in the same way as the seven supernumerary major-generals. It was not foreseen at the time that their promotion under a rule introduced in 1856 would be an infringement of what may be considered the vested rights of the senior lieutenant-colonels then on the list; the cases are precisely analogous, and in justice to these 10 officers we must equally recommend that they should not be deprived of their special promotion, and, on the other hand, that the then existing interests of the lieutenant-colonels should not be allowed to suffer; they should consequently be promoted to the supernumerary list of major-generals, according to the dates of their special promotions. This, as above observed, does not apply to the aides-de-camp who were legitimately promoted under an old rule, and who may consequently be fairly promoted to major-general, according to the dates of their appointments as aides-de-camp, without entailing any expense on the public.

Appendix 1, page 25, of Report of 1858.

Par. 19.

If the fact that, 11 aides-de-camp to the Queen were ap-

pointed in the interim, had been clearly brought to the knowledge of the Commissioners, it is impossible to suppose that they would not have discussed the effect, on their interests, of the proposed changes. Throughout the report no allusion is made either to these 11 aides-de-camp, or to the 10 colonels promoted under the 13th clause of the warrant of 1854. No allusion is made to Gen. Lindsay's evidence, except at par. 29, in which his tables are adopted without any qualification, and these tables give to the 21 colonels the exact places now claimed, but which places the adoption of the peculiar mode of the "antedated brevet" as a remedy for the grievance then under consideration prevented these officers from holding. It may, therefore, fairly be assumed that the effect of the antedated brevet was not fully foreseen, and this is all the more probable, because it was contrary to the spirit of the report, and the manifest feeling of the Commissioners, to propose any change affecting the positions of any class of officers without the fullest explanation. Indeed, the greatest consideration is shown throughout to the feelings of every class affected, except to the 21 colonels specially promoted. At par. 37 the claims of 23 officers promoted for service in the field, and who were included in the 115 officers passed over, are fully discussed; some of these 23 were promoted on appointment as aides-de-camp to the Queen in 1855, some under the 13th clause of the warrant of 1854, and some were promoted to be lieutenant-colonels for service in former wars.

ppendix 10, age 45, of Report of 858.

The number of this class being nearly similar to that of the 21 colonels now under consideration, may have led some of the members of the Commission to suppose that the interests of the latter had been protected; but the cases are entirely different, and on reference to the list of the 23 it will be found that none of the 21 are there.

A still greater instance of the consideration shown for the feelings of officers affected by the proposed changes is, that the first and principal reason given for the selection of the *antedated brevet* as the most desirable mode of carrying into effect the principle of re-arranging the list, is, that it "will be less invidious to the promoted colonels, to whom "every consideration is due;" this means that instead of bringing down Col. Jones from the date of 28 Nov. 1854, to his proper place below Col. Garvock, and dating him 12 Dec. 1854 (the date of the latter officer's promotion), it would be "less invidious" to Col. Jones that he should retain his date of 28 Nov., and that Col. Garvock should be put above him with a similar date, which was done.

ee printed xtracts rom Army ists in ppendix, age 52.

Now what officers look to is their relative position to the top of the list, and the date is a matter of very secondary importance.

The only other reason given in par. 48 for the recommendation of the antedated brevet is that "it will mark "more clearly the object and intention of the proceeding." Had it not been for the special promotions in 1855 and 1856 the antedated brevet would have been as good a mode of re-arranging the list as any other; but had its effect on the colonels so promoted been foreseen, surely par. 48 would have contained some more cogent reasons for its adoption. It would have been stated (as appears to have been the impression of Sir C. Yorke's Committee) that by no other mode could the list of colonels be fairly re-arranged; and surely some expression of regret would have followed, that by this measure four-fifths of the colonels specially promoted for service in the Crimea would be unavoidably deprived of the whole or a great portion of their promotion, and that as regards the prerogative of the Queen in the appointment of aides-de-camps, it would so far necessarily be annulled. It may here be observed that, had the report of 1858 ended with par. 47, the principle of restoration of the 115 complainants would have been fully carried out, and the tables of Gen. Lindsay would have been adopted.

ppendix 10, ages 45 and 0, of Report f 1858.

Par. 48 appears to have been an afterthought, and to have been adopted because the Commissioners had hastily arrived at the conclusion that the error of 1854 consisted in not having at once promoted all lieutenant-colonels (although none of them were in danger till the expiration of three years' service), and because it appeared on the whole the most convenient mode of carrying out the principle of restoration, the special promotions being overlooked.

It may here be observed that there were three simple ways of re-arranging the list, open to the Commissioners, and that their object was simply to "neutralize" the effects of the three years' clause, and "to consider what relief it is "still possible to afford." The complainants were 115 officers passed over; if each officer had been put up into the relative place which he occupied in May 1854, with a suitable date, the grievance would have been redressed. If each of the 206 colonels, promoted under the three years' clause, had been brought down to his former relative place the same result would have been attained. If, as proposed by Maj.-Gen. Lindsay, the Army List of June 1854 had been taken as a guide for the relative places originally held by the lieutenant-colonels, and each had been dated as colonel at the expiration of three years' service as lieutenant-colonel, no officer could have complained; now by each of these modes the 21 colonels specially promoted would have retained the places they now claim. It is evident, therefore, that the only difference in the result of the adoption of either of the above modes, or of the antedated brevet, is, that by the latter the 21 colonels are turned down, all the other officers holding exactly the same relative places by each mode.

Appendix 14, page 50, of Report of 1858.

On reference to the return printed by order of the House of Commons (27th Feb. 1863, Parliamentary Papers, pages 15 and 17) it will be seen that in August 1856, and again in July 1860, the late Lord Herbert recommended the restoration of the 21 colonels to the places now claimed.

In May 1862 (page 34) the late Sir G. Lewis wrote to the Treasury recommending that they should be promoted as if they held the places claimed.

Mr. Peel, in reply (page 40), clearly points out the justice of their claims, which the Lords of the Treasury consider to be such as not to warrant any charge to the public. This opinion being made known to His Royal Highness the Commander-in-Chief in August 1862, the Military Secretary replies, Sept. 1862 (page 56), that although adhering to his former opinion, &c., "His Royal Highness will not object "to the proposal being carried into effect."

This last letter was, however, cancelled by a letter of the Military Secretary of Feb. 1863 (page 40), stating that His Royal Highness, "having further reconsidered the question, is of "opinion that the objections to the proposal are so great that "His Royal Highness does not feel justified in agreeing to "it." It may be observed that the report of Sir C. Yorke's Committee has never been confirmed; on the contrary, the report is dated July 1861, and in May 1862, Sir G. Lewis wrote to the Treasury recommending the appropriation of a sum of 11,000*l.* to enable the colonels in question to be promoted in their proper turns as supernumerary major-generals. It is therefore incorrect to suppose that the case has been fully investigated and finally settled.

The arguments advanced against the restoration of the colonels in question are as follows:—

In the letter of the Military Secretary of Sept. 1859 (Parliamentary Papers, page 16) it is stated that the Commissioners of 1858 assumed that all lieutenant-colonels of date prior to June 1854 had a claim not to be passed over by any promotions made under a regulation which did not then exist, and recommended the antedated brevet in consequence. This is so, but the Commissioners forgot that the promotion of Queen's aides-de-camp, on appointment, was not a new regulation, but dates from the reign of George I.

Again, at paragraph 6, it is said, "it is of course to be "assumed that what was then done (in 1858) should have "been done in 1854;" but, on looking back to the report of 1854, this assumption falls to the ground. The technical difficulty as regards the antedating of some of these officers is next stated as an objection; this, however, had been foreseen and met in the War-Office letter of Aug. 1859 (page 15).

It will be observed that in this letter the injurious effect of the warrant of 1858 is fully recognized; it follows, then, that the objections to the redress claimed arise from the nature of the injury inflicted; this is like saying to a transported convict, whose innocence has subsequently been proved, we regret your unfortunate position, but there is no precedent for sending you home, consequently you must remain where you are.

The arguments in the report of Sir C. Yorke's Committee (Parliamentary Papers, page 4) are as follows:—

We cannot recommend "any change in the arrangements "made by the Royal warrant of 14th Oct. 1858, a warrant "founded on the report of a Royal Commission, consisting "of His Royal Highness the General Commanding-in-Chief, "five former Secretaries of War, &c." And again, "the "more we investigate the subject the more we feel convinced "that to disturb the present order of the colonels' list, &c." But the appeal to the Committee was against one of the recommendations of the Commission of 1858, and was made at the instance of the president himself, and with the concurrence of three of the members; therefore it was no argument to say that the arrangements made by a Royal warrant should not be disturbed, nor are any reasons given for arriving at that conclusion. It is as though the Lord Chancellor, in an appeal case, were to say, the Vice-Chancellor is a very competent authority, and it is undesirable to disturb his judgment, although, as in the case in point, the Vice-Chancellor himself may have seen reason to alter his opinion.

In paragraph 3, it is stated that Sir C. Yorke's Committee entirely concur in the view of the question expressed in

Sir C. Yorke's letter (as Military Secretary) of the 26th Sept. 1859. This letter has already been alluded to.

The arguments of officers who object to the proposed changes may be classed as follows:—

1st. Letters from Lord West and Colonel Percy written under the impression that they would be affected by the change, which is not the case, although it has been repeatedly stated in military and other newspapers; these officers claim a higher position than any of the 21 colonels, in virtue of the dates of their lieutenant-colonelcies, and although they were for upwards of three years below these colonels, their claims and those of many others to stand above them is not disputed.

2d. Colonel D. George, Colonel O'Halloran, Colonel Yorke, and Colonel Nedham have written to the effect that they are in some instances older officers than the 21 colonels, that they were senior as lieutenant-colonels, and that having by the antedated brevet regained the position above these officers which they held before the Crimean war, they hope not to be again superseded by them. The date of entering the service is manifestly irrelevant, as the Army List is not arranged with reference to seniority. The fact of these officers having been senior as lieutenant-colonels is in the nature of the case the special reward given to the 21 colonels in question was their promotion over all the lieutenant-colonels then above them on the list among whom were Colonels O'Halloran, &c. All promotion is given at the expense of some one or more officers. What these officers should endeavour to prove is that they had claims to be colonels before May 1855, in which case they would, like the colonels in italics in the extracts from the Army List of April 1863, have been entitled to resume their former relative places above the 21 colonels; for instance, if Colonel Nedham, R.A., being a lieutenant-colonel of Feb. 1854, could prove that he had any real right to be a full colonel of 28 Nov. 1854 (which he became by the *antedated brevet*), then he would establish a claim to stand before Colonel Warde, who being a lieutenant-colonel equally of Feb. 1854, was specially promoted in Nov. 1855; but Colonel Nedham can prove no claim to be a colonel until Feb. 1857, when having completed three years' service as lieutenant-colonel, he might fairly have claimed promotion whether qualified or not (he was not qualified or promoted until 22 Dec. 1857). By the antedated brevet Colonel Warde's special promotion has been cancelled, and he might as well have been at home as in the field.

Appendix, page 52.

3d. Col. Brownrigg has written to object to any disturbance of the list of colonels on different grounds from the above officers. It would appear that he objects to the principle of special promotion by selection, having undergone "the bitter mortification of being passed over by eight "officers junior to myself." Col. Brownrigg having by the accident of the antedated brevet resumed his original place above those eight officers, objects to their being replaced above him, on the grounds, not that he has any claim to be a colonel of Nov. 1854, but because "it is not altogether "unreasonable to expect that, should the army again have "to take the field, those officers who are considered to have "distinguished themselves would be likely to gain employ-"ment, and I should thus find eight additional obstacles "between myself and perhaps the chance of distinction." This may be considered as a personal argument, for Col. Brownrigg could claim, in virtue of his own special promotion, to be next to Col. Brunker, 18 places higher than he now stands; but then the eight officers above alluded to would be above him.

Appendix C, page 19, of Parliamentary Papers.

In conclusion, the claims of the 11 Queen's aides-de-camp and 10 colonels promoted under the warrant of 1854 may be thus briefly summed up:—The former class complain, that having been specially promoted under a regulation of long standing, they have been turned down, without a single allusion being made to them in the report, to positions considerably lower than those they might occupy with the fullest justice to the officers passed over under the three years' clause. The latter class complain, that having been specially promoted under the same warrant as the majors-generals selected for promotion in the Crimea, they have been deprived of the whole or the greater portion of their promotion, whereas the major-generals have been permitted to retain the whole of theirs as supernumerary major-generals. Both classes consider the antedated brevet to have been unnecessary, because full justice could have been done to the 115 officers passed over by other modes of re-arrangement, and to have been adopted by an oversight, because its operation on them is not mentioned in the report, and because the president and three of the military members of the Commission of 1858 have *so stated; vide* General Lindsay's and Sir James Scarlett's evidence, Sir F. Smith's statement in the House of Commons, April 28, 1863, and Sir F. Williams' note in possession of General Peel.

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## Copy of a Letter forwarded by Colonel Sir D. E. Wood, K.C.B., R. Art. (Received 14th May 1863.)

Sir, Littleton, April 9, 1859.

I trust you will excuse my troubling you, but as chairman of the Commission that altered the warrant of 1854 regulating the promotion of the army, on the amalgamation of Horse Guards and Ordnance, considering as I do that that through an inadvertency of that Commission an injustice has been done me, and having just returned from India, I could not before bring my claims under your notice; and I know of no one so proper as yourself to ask to take my case under your consideration.

I am a lieutenant-colonel of artillery, and as such served from the commencement to the end of the siege of Sebastopol, in command of the artillery of the 4th division, and I am the only one of my rank that never left the army, or was absent from my duty from any cause, from the commencement to the end of the siege of Sebastopol, and until the army quitted the Crimea. I was promoted for distinguished service in the field in November 1855, and the late Commander-in-Chief, on my return to England, complimented me on my service, and assured me no one would gainsay my promotion. My answer to him was, that if I had served in the French army I should have been made a general in April 1855, all officers in the French army, holding similar commands as myself, having been promoted.

Now I have just returned from India, having commanded the brigade of field artillery in the operations before Lucknow, and in the assault and capture of the place; afterwards the Right Honorable the Governor-General and his Excellency the Commander-in-Chief appointed me to command the fort at Allahabad and the brigade there, the most important station in India, with the rank of brigadier on the permanent staff of the Indian army, with a garrison varying from 3,000 to 10,000 men of all arms, with a depôt of sick and wounded soldiers from all parts of the north-western provinces, and at a time of the greatest anxiety, when Allahabad was surrounded by rebels. I successfully commanded there, and gained the approbation of my superiors. The conclusion of the rebellion induced the Indian Government to curtail their forces, and I was ordered home; and now find myself, by the alterations made by the Commission over which you presided, in the warrant of November 1854, placed back in my original, or nearly so, place in the army; and the only reward I have to acknowledge for my military life is a companionship of the Bath; whereas officers under my command have received one or two steps of promotion, and the companionship of the Order of the Bath. Belonging to a corps where promotion by purchase is not permitted, I did not feel aggrieved by officers in the army passing over my head by purchase, as I hoped for an opportunity, which did occur, of risking my life and health in the service of my country, to regain my place in the army that I had lost by those officers who had been promoted by purchase passing over my head, whilst serving at home and abroad in the subaltern ranks of the Royal artillery. Under the operations of the existing warrant, with a limited number of general officers for the Royal artillery, I see no prospect of regaining my place in the army.

The lieutenant-colonels previous to 1854, who were promoted by the new warrant and antedated brevet, gained their promotion over my head chiefly by purchase; and to this advantage has been added, by this brevet, a longer service as lieutenant-colonel, and their vested right to promotion by purchase secured to them against mine, who can only earn it by service in the field before the enemy; and when made a major-general every one of these officers who has purchased his commissions over my head is again to pass over me, who have earned my promotion only by distinguished service in the field. All I can add to this statement is, that it is the hardest trial of many that in 30 years' service I have had to endure, and it at this moment places me under the command of those who I have successfully commanded in the field before the enemy.

May I beg your powerful interest to obtain for me the rank of major-general, and release me from the position I am now placed in, hoping that when in that rank my turn comes to be again passed over by officers who have gained their promotion by purchase over my head, I may be serving in a rank which will prevent my being passed over by any but those who have distinguished themselves in the service of their country, and enable me to have an honourable ending to my military career.

I have, &c.

(Signed) D. E. Wood, Colonel,
Commanding 1st R.H.B. R.H.A.

Right Hon. Sidney Herbert, M.P.

## Statement of Major-General Stehelin, Royal Engineers.

Mr. President and Gentlemen,

Although my interests were so intimately connected with the subject, it is strange that until within the last three days, I was not aware that Colonel J. Gordon had last year made an endeavour to be promoted to the vacancy to which I succeeded as major-general.

The authorities having already done me justice in this matter, I should not have troubled the Commission with my present statement, but from the almost certainty that Colonels Gordon and Chapman have, or will make an endeavour to obtain the rank of major-general, with commissions antedated to mine, viz., 3d April 1862.

A certain military position was secured to me by Her Majesty's warrant, dated 14th October 1858, further confirmed by the warrant of 1861, and the report of a military commission. I have every reason therefore to expect and to hope that, unless forfeited by misconduct, that position will not be disturbed by any officer being placed over my head, the effect of which will be to deprive me for ever of obtaining the rank of colonel commandant of the Royal engineers—a step to which every ordnance officer on his appointment, and during the necessarily very long course of his service, was encouraged to look up to, as a reward in the latter years of his life for many years of toilsome and faithful service.

I entered the Royal Military Academy in 1813, and obtained my commission in 1816, under the expectation that this reward was secured to me by the principle of regimental succession to vacancies, throughout all the ranks of the corps; such principle having been established at the formation of the ordnance corps, and continued uninterrupted until lately, except in the instance of the late Lord Bloomfield, whose promotion to a battalion out of his regular turn in the Royal artillery was understood at the time to have been strongly opposed by his Grace the Duke of Wellington, master-general of the ordnance.

My grandfather entered the artillery under this regulation nearly 120 years ago (1746), and my father 87 years ago (1776), and both obtained battalions by regimental succession. I have been nearly 47 years in the Royal engineers, in like manner toiling through the several ranks, but whether I shall ever attain to the highest rank in the corps will depend upon the opinion which is given by the present Commission, on the endeavours that are making to place two officers, respectively 17 and 19 years my juniors, over my head, virtually placing me two steps down in the corps.

There must be seven vacancies before I can obtain the rank of colonel-commandant, and, according to the ordinary promotion, seven years must elapse before these vacancies take place. I am 65 years of age, and under present circumstances I must be 72 years of age before I can get my battalion; but, supposing two officers, about 18 years junior to me, are put over me, I may consider my chance of promotion to this step as for ever shut out, and remain the rest of my life as an unattached major-general, Royal engineers, with an inadequate income.

Out of 47 years' service on full pay I have been nearly 30 years abroad. I have served in the hottest and coldest of climates, Mauritius and Canada, and was at Bermuda during the great sickness of 1819, when one half, officers (Captain Mercer) and men of the 6th company, Royal sappers and miners, died of the yellow fever, and out of a detachment of one serjeant and his wife, one bugler, and 12 sappers, which went out with me, we lost the whole party, except one sapper and a young bugler. During the time I was battling with this malignant disease, Colonels Gordon and Chapman were still in their infancy, and before either of them had obtained his commission I had served 11 years abroad at two different stations, west and east of the Cape of Good Hope.

I have had staff employments in Ireland and Canada for 13 years, and a colonial one for three years, and I trust I need not say I have always done my duty faithfully and zealously, and to the satisfaction of the officers of the corps under whom I have served, and it would be an unmerited reflection on myself, and the other officers of my standing, to suppose we should not have done our duty in the Crimea, if we had been called upon to serve there.

The rank of colonel is a permanent one in the ordnance corps, and the brevet rank of major, lieutenant-colonel, and colonel does not exonerate, nor has not exonerated Colonels Gordon and Chapman, and other officers, while captains, from rising to lieutenant-colonel by regimental succession; and I submit to the Commission that it appears an injustice, therefore, to the elder officers, that officers holding brevet rank should be able to dispense altogether with the rank of regimental colonel, by becoming colonels, commandant over the heads of 20 or 30 senior officers of the corps.

I annex a comparative statement of the dates of my several commissions, and those of Colonels Gordon and Chapman.

I have the honour to be,
Mr. President and Gentlemen,
Your most obedient servant,
Ben. T. Stehelin,
Maj.-Gen. R. Engineers.

No. 6, Waterloo Place,
Southampton, May 20, 1863.

| | Stehelin. | Gordon. | Chapman. |
|---|---|---|---|
| 2d Lieutenant - - | 1816 | 1833 | 1835 |
| 1st do. - - - | 1825 | 1837 | 1837 |
| Captain - - - | 1838 | 1845 | 1846 |
| Brevet Major - - | 1851 | 1854 | 1854 |
| Bt.-Lt. Colonel - - | — | 1855 | 1855 |
| Lt.-Colonel - - | 1853 | 1856 | 1859 |
| Bt.-Colonel - - | 1854 | 1855 | 1855 |
| Colonel - - - | 1858 | — | — |
| Maj.-Gen. - - - | 1862 | — | — |

Maj.-Gen. Stehelin's services abroad.

| | |
|---|---|
| Bermuda - - - - | 3 years. |
| Mauritius - - - - | 8 do. |
| Canada - - - - | 15 do. |
| Gibraltar (Com. R. Eng.) - | 3½ do. |
| | 29½ years. |

## Letter from Colonel Ormsby, Roy. Art.

Shorncliffe, May 14, 1863.

My dear Sir George Brown,

Seeing you are appointed one of the Royal Commissioners to investigate the claims of the "distinguished Colonels," I take the liberty of bringing to your notice how seriously my prospects would be affected by any alteration in the warrant of 1858.

Having been a lieutenant-colonel of 1854, I, together with more than 100 other lieutenant colonels, were either promoted to the rank of colonel, bearing date the 28th Nov. 1854, or antedated to that day, by the effect of the royal warrant of 1858. The colonels of 1855, whose case General Lindsay advocates, I presume, wish to be placed in the list of 1854, and evidently they do not claim the being placed at the bottom of that list, as in that case they would gain nothing by it; I can, therefore, only suppose that they desire to be placed before those who were promoted on the 28th Nov. 1854.

I beg, therefore, to submit, that if such an event took place I should consider it an injustice to myself, for instance, in the month of May 1854, just previous to the brevet of June 1854, Sir T. Troubridge, Colonel Dickson, Colonel Norcott, Colonel Lysons, and Lord Longford were majors; and Colonel Gordon, H.S.H. Prince Saxe Weimar, Sir D. Wood, Colonels Fitzmayer, Chapman, and Wetherall were all captains. If, therefore, the above-mentioned officers were antedated as colonels to Nov. 1854, they would become colonels when they were not even majors. Some did not become even brevet-majors until 12th Dec. 1854; so that if they were antedated as colonels to Nov. 1854, they would be holding commissions as colonels when actually they were only captains in the army.

Now, as all of these "distinguished colonels" had two steps of brevet-rank, and several of them three, in a little more than a year, I conceive that they have no claim to be placed over me. I having been a lieutenant-colonel in the early part of 1854 (March).

In conclusion, I beg most respectfully to state that I shall consider it a great grievance should these colonels be placed before me; none of them became lieutenant-colonels before the 20th June 1854, and I became a lieutenant-colonel before the operation of the warrant of 1854, and at that time these colonels of 1855 were not only not lieutenant-colonels, but the greater portion of them were simply captains in the army, and holding no brevet rank whatever.

I trust you will excuse the great length of these remarks, and accept my apologies for trespassing on your time.

I have the honour to be, &c.
J. W. Ormsby,
Col. Com. 9th Brigade Royal Artillery.

General Sir G. Brown, G.C.B.,
&c. &c.

## Colonel O'Halloran's Statement.

In making the following statement, I cannot hope to throw much light upon the question which is now undergoing consideration, and which, in the reports that have been so carefully, lucidly, and comprehensively prepared, and in the

recent debate which took place in Parliament, appears to me to have left little more to be said on either side; and therefore it is with great unwillingness that I intrude myself upon the attention of the Royal Commissioners; but my name having been prominently mentioned by Major-General the Honourable James Lindsay, M.P., in his speech before the House, (in connexion with Colonel George,) as protesting against the exercise of the royal prerogative, in the case of certain officers promoted to be Queen's aides-de-camp in 1855–56, I beg to say, that, so far from disputing that prerogative, I take my own stand upon it, and point to its attempted violation as regards my own rights, and those of others similarly circumstanced.

I was lieutenant-colonel some 16 or 17 months before the warrant containing the three years' qualifying rule came into existence. It ought, therefore, to have been inoperative in my case, and in that of every officer who became lieutenant colonel prior to its publication, in any way to cause us disadvantage. We were not fairly subject to its retrospective action; and in order to remedy the great wrong which we suffered thereby (a wrong which no one attempted to dispute) a Royal Commission was convened to consider the question in all its bearings; that Commission, which included General Lindsay as one of its members, submitted to Her Majesty (General Lindsay being dissentient from the course recommended) that all those lieutenant-colonels who had been superseded, in violation of regulations as they existed when they respectively attained that rank, should one and all have their commissions as colonels antedated to 28th November, 1854; and Her Majesty, on the recommendation of His Royal Highness the General Commanding-in-Chief, having graciously approved the suggestion, I conceive the royal prerogative in our case to be just as binding, and just as forcible, as the prerogative quoted in the case of the colonels who were created such for distinguished service. I cannot, therefore, accept General Lindsay's argument as affecting in the slightest degree the stability of the position which I occupy under the Queen's warrant. I have nothing whatever to do with things as they *might have been* under the operation of a different view of the claims of the distinguished service colonels, than that which was actually taken by the Royal Commission of 1858, and which has been so clearly set forth in the published report. I have nothing to do with deductions drawn from any hypothetical bases. My arguments apply to facts as they stand, and those facts are that Her Majesty having, by Her gracious will and pleasure, created me a full colonel on the 28th November 1854, no officer promoted for distinguished service at a *subsequent date* can lay claim to supersede me in that rank, or to apply with that view for a recognition of services before those services were actually performed.

Up to the year 1854, when the Russian war broke out, no officer who had attained the rank of lieutenant-colonel could possibly, under any circumstances of service, be superseded by his junior, unless through the operation of the Royal prerogative in creating that junior aide-de-camp to the Sovereign; and even that did not necessarily involve the rank of full colonel, of which fact I believe there are two instances on record, during the reign of William the 4th. Now, only nine out of the 22 officers, whose distinguished services it is proposed to antedate to a period when the very occasion for those services had not arisen—which I need not observe is a violation alike of military fact and of military usage—were created full colonel in the manner referred to; and four of them being only captains on the 28th November 1854, it was impossible for them, whether by creation as Queen's aide-de-camp, or otherwise, legitimately to become colonels on that date, inasmuch as they were two steps of rank short of the required qualification. The same remarks apply in degree to five others, who were majors at the date referred to; and in the proposed way of overcoming this difficulty, namely, by antedating the commissions of these officers, both as lieutenant-colonels and majors, I only see the awkward precedent established, that degrees of rank, which cost some men the labour of a life to attain, may be jumped over by others without the inconvenience or the drudgery of serving a day or an hour in either.

The oldest officer on the list of those who seek to supersede me is three and a-half years my junior in point of first commissions, and others were not even *born*, when I was serving Her Majesty's predecessors (William IV., George IV., and George III.,) in her distant colonies.

As regards comparative quality of services, upon which, in the recent debate, as well as in clause 33 of his counter-report dated 25th July 1861, General Lindsay has laid so much stress, *that*, I beg to observe, in my own particular case at least, has not been of my own choosing; and few, I think, would like to tread the same slow, and discouraging, and hazardous path, that I have done; slow, without escaping the necessity thereby, for purchase; discouraging, from first to last, except in the solitary instance which it is sought now to disturb; and perpetually hazardous, without hope or chance of distinction. I know that the circumstance of an officer being "unmedalled," constituting as it does the absence of a feature of service which very properly ranks as the highest in the order of consideration, places that officer at a disadvantage as compared with those who have won decorations, but who, it should be remembered, in those very decorations, have much to cheer them in the onward path of duty, and to increase alike their military contentment and their zeal.

Conceding to these gallant men their well-earned title to their country's favour, I would yet respectfully submit, on behalf of the class which I myself represent—the officer of long and hard colonial service—that no man can do more than fulfil the requirements of his Queen and country, *in the form in which they are presented to him;* cheerfully accepting the rough as well as the smooth; cheerfully encountering those risks of climate which carry with them neither distinction nor reward, and from which, therefore, most men are disposed to shrink; risks which, if my own experience, or the published statistics on the subject, be of any value, may, in their mortality, compare with any battle fields.

I served in one regiment, the 69th, for 34 years and 5 months, being present with it wherever its colours were unfurled during the above long period; and, though undecorated, I have documents to show that *that* was my misfortune, not my fault; having asked for war employment whenever a chance presented itself, namely, after the battle of Chillianwallah, during the Crimean campaign, during the Indian mutiny, and when the Trent affair broke out; offering, on the last-named occasion, to give up my retired full-pay of 20*s.* per diem for service in "any form" in the field.

It is well known that, in the Duke of Wellington's opinion, it was of small moment whether, in following the fortunes of his corps, an officer had been in action or not. His great principle was the faithful performance of *duty* in whatever form it came; and he cared not whether that duty was at home, abroad, in good or in bad climates, or before the enemy. The point to which his inquiries invariably tended was: Has the officer well done his duty? Has he gone with his regiment wherever it was ordered? Has he shared its services without evasion, at all times, and under all circumstances? He knew and felt the justice of this principle. He knew it was not in an officer's power to *select* service, except by "exchange;" and this, as leading to frequent shirking of duty, he was sternly and unbendingly opposed to. I contend, therefore, that the performance of duty, in the view taken of it by England's greatest general, ought to weigh in the balance against all adventitious influences, whether of birth, or interest, or wealth, or even the luck of being present where troops are successfully employed, a luck which seldom fails to carry with it the additional luck of rapid promotion, and decorations, and honours, and pension, and well-paid staff employment.

Finally, I would observe, that to alter our position now, after a five years' tenure of that position, would necessarily destroy, in the minds of military men, all confidence as to the present and the future of their professioal career.

H. D. O'Halloran, Col.

50, Elgin Crescent, Kensington Park, W.,
23 May 1862.

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## Lieut.-Colonel Haygarth's Statement

49, Chester Square, May 14, 1863.

Lieutenant-Colonel Haygarth (late Scots Fusilier Guards), has the honor to submit to General Peel, and the members of the Commission appointed by Her Majesty to inquire into the working of the warrant of 1854, his claim to be promoted to the rank of colonel, which would now be purely honorary, but which he humbly submits he ought to have received previous to his retirement from the service in 1860, he having attained the rank of lieutenant-colonel and captain in the guards on the 14th July 1854, previous to the issuing of the warrant of October of that year, which altered all the rules of promotion. Lieut-Col. Haygarth believes that nearly 300 Lieutenant-colonels were promoted over his head previous to his retirement from the service. This he always considered a great hardship, after having served 20 years in the guards (six of which as adjutant), and having been so severely wounded at the battle of the Alma as to unfit him for active servive. He ventures therefore to submit this statement to the favorable consideration of the Board, hoping, that should the petition of Colonel Carleton be granted, the claims of those promoted to be lieutenant-colonels at the same time as him, but who have since left the service, may not be over-looked.

To Lieut-Gen. Right Hon. J. Peel,
&c. &c. &c.

# The 1858 Evidence.

Copy of Evidence taken before the Royal Commission of 12 April 1858.
(Not published with their Report.)

## Wednesday, 28th April 1858.

PRESENT:

H.R.H. The Duke of Cambridge, K.G.
His Grace The Duke of Newcastle.
The Right Hon. Earl Grey.
Major-General Lord Rokeby, K.C.B.
The Right Hon. Sidney Herbert.
The Right Hon. Edward Ellice.
Major-Gen. Sir J. M. F. Smith, K.H.
Major-Gen. Sir W. Fenwick Williams, Bart., K.C.B.
Colonel Sir H. K. Storks, K.C.B.
Colonel Henry Eyre.

The Right Hon. SIDNEY HERBERT in the Chair.

Colonel The Hon. James Lindsay, examined.

1. (*Chairman.*) What rank do you hold in the army?—Colonel and captain and lieutenant-colonel in the grenadier guards.

2. You have given, I believe, a good deal of attention to the operation of the warrant of 1854?—Yes, I have.

3. Will you state the substance of the grievance which you consider has been undergone by lieutenant-colonels since the warrant was passed, by being passed over by other lieutenant-colonels who had the command of regiments?—The grievance with regard to these particular officers is this, that officers who had risen to the rank of lieutenant-colonel before the 20th June 1854 under the then established rules of the service, have, by a sudden alteration of system, and by a new rule made to apply to that rank after they had obtained it, been passed over and superseded by lieutenant-colonels junior to them, who had the good fortune to come within the provisions of the new rule, and which is therefore retrospective in its action upon them.

4. You mean that portion of the warrant which gives the rank of colonel to a lieutenant-colonel after being three years in command of a regiment?—Yes; I had better state what the rule and practice had been beforehand. The rule and practice of the service had been, for a century and more, that when an officer had once obtained the rank of lieutenant-colonel, he rose in succession in the place which the date of his commission as lieutenant-colonel gave him, by periodical brevets, to the higher ranks of colonel and general, and no one could pass over him except in a case marked out for the special approbation of the Crown. By the new rule lieutenant-colonels in command of regiments, or brevet lieutenant-colonels on the staff, are, after having served three years in those capacities, to receive the rank of colonel.

5. In what manner have the lieutenant-colonels been affected by that rule?—In this way; on the 28th of November 1854, all substantive lieutenant-colonels who had then completed their three years in command were promoted to the rank of colonel, by which they at once went over the heads of all those who had not complied with the terms of the new rule; on that day 108 officers were so passed over, some of them lieutenant-colonels who had not served three years as such, others, regimental majors, and brevet lieutenant-colonels. Since the above date, as each regimental lieutenant-colonel completes his three years' service, he goes over those senior to him on the list who have not done so.

6. Do you hold that it is impossible to make any new regulation for the efficiency of the service, if it tends to operate injuriously upon the private interests of individual officers?—I hold this, that existing interests ought to be secured, and that the new rule which was then made could have been carried out with full security to those existing interests.

7. As I understand you, you do not object to the rule by which officers who are serving pass over the heads of those who are not serving, but you object to that rule being applied to persons already in the rank?—Yes, that is the first objection, but the objection would naturally go a little further, and which will probably be mentioned hereafter, that there are certain officers who had not then existing interests as lieutenant-colonels, but whom it might be the natural duty of the military authorities to protect, they having served a sufficient length of time under the old regulations to secure to them the full value of their general's rank and pay when they attain that rank.

8. But the lieutenant-colonels who are passed over, not being in command of regiments, will ultimately rise by seniority to be major-generals, will they not?—They will do so, but in the meantime they are passed over, and they are existing interests. When periodical brevets were abolished by the warrant of October 1854, a rule was made which limited the number of generals to 234, and enacting that until the list was reduced to that number, one colonel, one lieutenant-colonel, and one major were to be promoted for every three deaths among the generals. After the list was reduced, one was to be promoted for every death, but in the meantime, although promotion may be going on, yet those officers are undergoing continually supercession, by which that promotion is rendered more remote.

9. But the change from periodical brevets to the regular annual promotions upon every death vacancy does not affect the question one way or the other, for whether 100 men are promoted once in five years to be major-generals, or 20 are promoted every year to be generals, it comes to the same thing?—Yes, that applies to the rank of general, but the periodical brevet system could not have been conducted with this new system; under the old system the supercession would not have gone on.

10. When a general officer dies there is a brevet limited to one person, is there not?—Yes.

11. Therefore the warrant does not affect injuriously the interests of those particular officers?—It does so, because under the old system they would have been promoted without being superseded.

12. The doing away with the periodical brevet, and substituting the present system, does not affect their interests injuriously or otherwise?—No; as far as those officers are concerned they have not yet arrived at that position, and no doubt the brevet which goes on on every death vacancy is a better system than the periodical brevet; it is more just to those who are at the top of the list.

13. Does it affect the question of purchase in any way? Is it more advantageous to officers who then knew when their turn would come, and made their arrangements accordingly?—Yes, I think it gives them a better opportunity, as they are not taken so suddenly.

14. It prevents, does it not, to a certain extent, the gambling of the officers, running themselves against the probability of a brevet?—I do not see that?—

15. I mean that an officer is not caught by an unexpected brevet, and so loses the value of his commission?—Certainly he is not.

16. Will you state to the Commission the number of the officers who had obtained the rank of lieutenant-colonel before the 20th of June 1854, have been superseded under this rule, and are now serving?—The total number at present serving on full and half-pay, who became lieutenant-colonels before the 20th of June 1854, is 115. Of course, I have no official knowledge about all these transactions; I merely give an approximation. I have taken it from the Army list and from what is in the Gazettes; it is therefore subject to correction, but I believe the total number at present serving on full and half-pay is 115, 34 of whom may be excluded from calculation at present, as having been many years on half-pay, and not having served six years as field officers on regimental full-pay, they will not affect the ulterior rise of others to the rank of major-general.

17. They will not affect the case, nor occupy any of the places of the 234?—Just so; they will have an asterisk attached to their names.

18. They will not obtain that nominal rank of general so soon as they otherwise would?—Certainly not, for they have been passed over.

19. Is there any classification into which you can divide those 115 lieutenant-colonels?—Yes; there are peculiar circumstances affecting some, but I hope I may say, as I am here to express an opinion which I do, under correction, that I hold, that under no circumstances, unless a strong case of public good can be made out, could the authorities be justified in applying this new rule to officers who are in the enjoyment of the particular rank affected by the rule.

20. Under those circumstances, you would debar the Crown from ever making a change affecting any officer in the rank to which that change was to apply?—I would judge of that change when I saw it before me, but here is an instance in which neither the late Commission, nor any body that I ever heard, has attempted to make out a case in favour of the public good.

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21. The late Commission made out this case for the public good:—That whereas the major-generals were very old, and as the succession to their rank was by seniority, and they were not likely to get younger, it was important to select officers from the rank of colonels, and to employ them in command as brigadiers, with a view to give them experience, which would not be lost by their becoming too old to serve again; was not that an important consideration?—Certainly; but with regard to those officers whose position is the present subject of inquiry, the Crown is fully competent to do all that is requisite, without injuring those interests.

22. By passing men who are in the command of regiments, and who are therefore still with their corps, and fresh from military experience over the heads of those who are not serving and on half-pay, do you not get younger men, and in all probability more efficient men as colonels, than you would if you left them all to become colonels by seniority, including those who were not serving and on half-pay?—It is impossible to say that you would not do so, but the practical effect as far as those particular officers are concerned has not been so. There are a great number of officers very young in the service who have been excluded from the rank of colonel under the operation of this warrant.

23. Not substantive colonels?—Not generally, but some have been passed over because they had not served three years.

24. Those are officers who have never been in the command of a battalion?—Yes, but still they were in the enjoyment of that rank before this new rule was thought of, and I think that they come under the head of existing interests, which should have been secured.

25. Do you consider that the fact of an officer having purchased that step, subject to certain conditions which have been subsequently changed, is an additional reason why no such change should have been made?—With regard to this particular body of officers only in one class of instances; I have excluded wholly the idea of purchase throughout, but still in these existing interests the question of purchase does come in in a manner which I will mention to the Commission. There are officers being regimental majors, and having the rank of brevet lieutenant-colonels, who made arrangements relying upon the faith of the existing regulations, and allowed a junior major to obtain the command of a regiment over them; that is the only instance in which I have considered the question of purchase.

26. What was their object in making that arrangement?—This was their object; they were already majors, and they became in course of time by the number of years they had served as majors brevet lieutenant-colonels, but having attained the rank of brevet lieutenant-colonel, the major says to himself, "I am now in full swing for further promotion to the rank of colonel and general; no one can go over my head; in garrison, in camp, with the army in the field, my brevet rank is good for all purposes of command. I do not care about purchasing the command of my regiment, and I will let a junior major go over my head." He does so, and the junior major becomes lieutenant-colonel commanding a regiment, and in three years time he gets the rank of colonel, while the officer who had been major and brevet lieutenant-colonel, and who had been purchased over, remains still the senior major, and does not get the rank of colonel. That is the way in which it works.

27. The case you put is that of an officer who, upon a speculation of his own, thought it advantageous not to take the command of a regiment, but to wait his turn to become, by brevet, major-general, which he might have become without having the command of a regiment?—That is so; but this officer is included in that particular body, and as the Commission of 1854 expressed itself, those officers who had relied upon the faith of the existing regulations should have their interests secured.

28. With a view to securing those interests as far as could be done, was there not an increase of retirement from the rank of lieutenant-colonel given?—Yes, but of course it is optional with the officer whether he chooses to take it. Any one wishing to serve naturally will not accept it.

29. Suppose this case, that a man may be passed over by six officers, but on the other hand six of his seniors accept the new boon in the shape of additional retired pay, he is, relatively to his rank of major-general, exactly where he was?—He is pushed on by the six who are gone away.

30. As much as he is pushed back by the six who have passed over him?—Yes, it is the same in that way so far.

31. *Pro tanto* that increase of the full pay retirement was an advantage, not only to the men who took it but to those below them who did not take it?—No doubt, the more that go above your head the better. There is another class of officers, of whom there are 21, who have been so passed over, and who have obtained the rank of brevet lieutenant-colonel for distinguished services in the field; and the question arises—what was Her Majesty's intention in conferring that rank upon those officers, and whether it was not her intention to give them the full advantage of the rank which she had conferred upon them? I think perhaps the best way of illustrating it is by taking the case of an officer who has lately been promoted out of the rank of colonel, and therefore he is no longer affected by it. I refer to Major-general Inglis of Lucknow. Major-general Inglis was promoted to the rank of brevet lieutenant-colonel for distinguished services in the field in 1849, which was five years before this new rule was issued. He had no less than 59 officers, which is a small number compared with what some have had pass over them, placed above him, but he has since had the good fortune to get out of the position of colonel. In consequence of his gallant defence of Lucknow he is now a major-general. But in the same position in which he formerly was, there are 21 officers who had been promoted for distinguished service in the field who have been passed over.

32. I understood the case to be this, that majors having obtained the rank of brevet lieutenant-colonel for distinguished service in the field, were, by the operation of the warrant, deprived of part of their reward, as the brevet lieutenant-colonelcy would take them much slower to the rank of major-general than under the old rule?—Yes, but at the same time a man who had so earned his reward ought not to have been superseded. Her Majesty approved of the warrant, but such is the opinion which, as an officer, one cannot help expressing if one is asked the question.

33. On the other hand, those officers if they reached the command of their regiments would pass over the heads of others?—In the same manner those officers not only would, but they have done so in certain instances.

34. Some of those who had been first injuriously affected have been since advantageously affected?—A few of them have been advantageously affected. A few have gained perhaps more than they lost, while others have never regained what they lost.

35. In the case of Colonel Inglis he has attained the rank of major-general?—Yes, he is benefited by the operation of another clause.

36. Is there any other class of those superseded lieutenant-colonels whose case you wish to describe?—There is another class of substantive majors who were promoted to the rank of brevet lieutenant-colonels for the length of their service as majors and are affected as I have pointed out before.

37. They will become brevet lieutenant-colonels by the operation of the old brevets?—Yes. I have now mentioned three classes. There is still a fourth class, who though they would naturally expect to be promoted, yet will have an asterisk placed against them, from not having served their period of six years as regimental field officers on full pay.

38. (*Mr. E. Ellice.*) How many are there in that class?—34. The four classes are—the officers promoted to brevet lieutenant-colonelcies for distinguished service in the field; the majors promoted to brevet lieutenant-colonelcies under the old brevets; the majors promoted to brevet lieutenant-colonelcies under the old brevets, but who had allowed themselves to be purchased over by junior majors, they having already obtained the rank of lieutenant-colonels; and a fourth class of officers, who have not completed six years of service on full pay—the asterisk officers.

39. (*Chairman.*) What is the existing rule with regard to service as a field officer, which entitles a colonel to obtain the real rank of major-general, and not the asterisk rank?—It is an old rule. I do not know the date of it, but I believe it is as old as 1840 at the least, and which has this effect. It enacts that an officer who has served six years as field officer is entitled to the pay of a major-general upon arriving at the rank, but if he has not served the six years as field officer he is entitled only to the half-pay of his last regimental commission. It has always been considered the standing rule, before the issuing of the warrant of 1854 by which if an officer had qualified himself by serving six years as a field officer he is entitled to all the progress he can make in the service.

40. Do you not think that the rule is a very sound one, as it gives an advantage to those officers who act as field officers over those who do not?—Certainly.

41. When that was introduced it must have pressed with

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great hardship upon men who, but for that rule, would have obtained the rank and pay of major-general when they arrived at it?—I cannot deny that, if it did so I will ascertain that.

42. Still, admitting the rule to be good, if your principle that the vested interests of officers in all the conditions of rank in which they are, had been held good at that time, that change could not have been made?—The change was made in this way:—previous to 1814 a general officer received the full or half-pay of his regimental commission. In 1814 special provision was made for general officers, viz., general 1*l.* 18*s.* 0*d.*, lieutenant-general 1*l.* 12*s.* 6*d.*, and major-general 1*l.* 5*s.* 0*d.* a day. On the 18th Feb. 1818 these rates were abolished, and 120 generals, without reference to their rank, fixed at 1*l.* 5*s.* 0*d.* a day, in addition to colonels of regiments. A brevet followed in 1819, when the generals promoted who were on half-pay continued to receive that half-pay only. On 18th November 1822 a warrant was issued granting from 25th December 1821 to all general officers who were on half-pay, the full pay of the last regimental commission. This grant was accompanied by the condition that the officer must have served six years on full pay as a field officer of a regiment or in some military capacity. Therefore the six years' rule did not injuriously affect any existing interests.

43. Is there any other observation that you wish to make as to the six years' rule?—Simply this, that in the course of the conversations which one naturally has, and judging by the feelings of officers with whom I have communicated, they certainly are of opinion that having acted under that rule, and having qualified themselves under that rule, it is a hard case that they should be superseded by others, some of whom have not actually served their time.

44. What is the number of the lieutenant-colonels promoted to colonels who have been promoted over the 115 you have described?—Of the 115, 68 have been promoted, and 47 have not been promoted.

45. Out of the 115 who have been passed over, some again have been promoted, and passed over others?—Some have.

46. What number?—About 30, who were themselves first superseded and afterwards passed over others.

47. But they recovered their original rank, did they not?—Yes, but not their original position; they have attained a superior rank.

48. Possibly they stand as near to the rank of major-general as they would have done under the old system, though the men before them are different men, and the juniors are different?—No, I do not think they have done that; it is possible that some may.

49. Although they will have subsequently the advantage of a rise, upon the whole you think they have still suffered?—Yes. From those 115 which I have mentioned must be deducted the 34 who, by the rules in existence, will be asterisk officers. This leaves, therefore, an effective list of 81 who have been altogether superseded.

50. (*Mr. E. Ellice.*) None of them have since been promoted?—Yes. Of this number 54 have been promoted.

51. (*The Duke of Cambridge.*) There are 81 altogether, and of those 54 have been promoted?—Yes, and 27 are still lieutenant-colonels not promoted.

52. (*Chairman.*) Will they not be promoted?—Some of them may, but many will not until death vacancies promote them in succession. Some of those officers, it is right to say, have not served their six years.

53. Surely all the 81 have?—No, but they are in progress of doing so.

54. (*The Duke of Cambridge.*) They are in a position to complete the term of service?—Yes, they are working up to that point.

55. They are on full pay?—Yes. I have prepared a return, which is before the Commission. I may mention the case of Colonel Garvock, who was promoted for distinguished service; he was passed over by 55, and gradually you get down to the officer who has had the greatest number put over him, which is 151. I may mention that one of these officers is Colonel Franklin, who has served, I think, 14 years as a field officer.

56. (*Sir W. F. Williams.*) In what regiment?—He commands a depôt battalion, I think.

57. (*Chairman.*) There are three officers, Lord West, Colonel Percy, and Colonel Steele, who were made aides-de-camp to the Queen?—Yes.

58. That gave them the colonelcies, did it not?—Yes.

59. That is not under the warrant of 1854?—No, under the old rule.

60. Those three officers are not peculiar to this warrant?—No, but they are affected; they had been passed over before they became aides-de-camp.

61. (*The Duke of Cambridge.*) You place them in the position in which they originally stood before they became aides-de-camp to the Queen?—Yes.

62. The subsequent rank which they may have attained as colonels or aides-de-camp will be very different from this return?—It is different from this return.

63. (*Chairman.*) Can you state to the Commissioners the numbers of the officers who have passed over others?—I will supply that. I did not think that that was of so much consequence, the real consequence is to those who are passed over.

64. What remedy do you propose for those officers who have been passed over?—The remedy that I humbly must suggest (I do not speak invidiously, when I state that officers in the army consider the case unjust)—then in justice, I think, there is but one thing to do, which is to revise the position, and let those officers all hold the relative position which they did hold as lieutenant-colonels.

65. That is, that those who are now colonels, having obtained that rank by three years' service, would be put back to the rank of lieutenant-colonel?—By no means whatever.

66. (*Sir H. K. Storks.*) You would pigeon-hole back every man into his proper place, who was a lieutenant-colonel on the 28th of November 1854?—No, not all in that date.

67. (*The Duke of Cambridge.*) Then will you explain what you mean?—I would take the warrant of 1854, which says that a lieutenant-colonel commanding a regiment is to become a colonel in three years, as the base of the alteration. A certain number of them were promoted on the 28th of November 1854, at which time a good many were passed over. I would begin with the lowest of those officers who were promoted on the 28th of November 1854, and I would promote all those above that officer, and date them from the 28th of November 1854.

68. (*Chairman.*) Then an officer in command of a regiment at the expiration of three years would be promoted to be a colonel, and he would carry up all the lieutenant-colonels senior to him, who had been also promoted to be colonels?—Yes, as is now done by the promotion of an officer to the rank of major-general. When an officer who is qualified for general's rank and pay is promoted, all those who are asterisks above him are promoted at the same time.

69. Would not the operation of that be this, that all lieutenant-colonels in command of battalions would be promoted to colonels on the ground that they had commanded battalions, and all senior to them would be promoted, although they had not commanded battalions, on the ground that they were seniors in the army list to those who had?—Yes, and continue that system throughout the list.

70. You do not propose that as a rule for the future, but it is simply to cover the cases of those lieutenant-colonels who were affected by the warrant of 1854?—Yes; I think from all I have heard, and from the best opinion I can form upon the subject, that it is considered to be a very great hardship by those officers.

71. Do you consider that by that arrangement you will get all those officers to stand in the same relation to one another, just as if the warrant had never been in operation?—No doubt of it. But there is one class of officers who intersect them, and those are officers who have been promoted for distinguished service, and they will occasionally intersect their dates.

72. (*The Duke of Cambridge.*) How do you propose to do that?—In this way, sir. I would take an officer, qualified by regimental command to be a lieutenant-colonel, and those officers promoted to the rank of colonel for distinguished conduct will follow that officer exactly in the same place as now they do.

73. (*Chairman.*) Take a higher case; Colonel Inglis was made major-general for distinguished service?—That is quite a different case. Her Majesty may approve of the distinguished conduct of an officer in the field, and she selects that individual officer for what promotion she pleases.

74. But if an officer being a lieutenant-colonel is promoted to colonel for distinguished conduct in the field, he would not carry anybody up with him; would you not consider that an exceptional case?—Yes, in this way, if what we are calling justice was given to those officers who are passed over, they would have been promoted to colonel before the officers who were promoted for distinguished conduct in

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the field, and therefore they would be above them. In that way the officers who are promoted from lieutenant-colonel to colonel will be affected and in no other way.

75. (*The Duke of Cambridge.*) You would make an exception for distinguished conduct?—Yes, but I wish to be understood when I say an exception in favour of distinguished conduct. They would fall into their places according to the alteration of the dates of others.

76. (*Chairman.*) You want to make a retrospective correction of the list before you will deal with those officers as to distinguished conduct?—Yes, but I would not alter the date of a single man who had been promoted for distinguished conduct in the field.

77. You would not apply your rule as to moving those men up to cases where officers were promoted for distinguished conduct in the field?—Certainly not.

78. Why do you make that distinction with regard to distinguished service in the field, because that is also new?—No, I do not think that is new; it may be difficult perhaps to point out instances, and the Duke of Wellington found great difficulty in promoting men from the rank of lieutenant-colonel to the rank of colonel. There are instances, although I cannot exactly point them out. It is quite competent to the Queen to do it.

79. Now it is done directly?—Yes.

80. The cases may be fewer, but it is *pro tanto* just as much an invasion of your principle with regard to the vested rights of the lieutenant-colonels as in the other case?—I do not think so. In the case of the warrant of 1854 it is adopting a new system which is made to apply to a body of men. In the other case it is Her Majesty picking out officers to reward for distinguished service in the field; it may be an individual or a few individuals, but I never heard the slightest opinion expressed in the army against the exercise of Her Majesty's privilege, except in the case of generals, where it is thought they should be supernumerary to the establishment.

81. In the one case it is Her Majesty selecting a few individuals to promote, and in the other it is Her Majesty selecting a class of officers?—No doubt it is so; but that in my opinion is the whole difference in the case.

82. Have you ascertained what would be the effect of such an alteration upon those who would be replaced in their former relative positions, as also upon those who have been promoted under the rule, and who will consequently lose their present relative positions?—I have done so, and I have taken it irrespectively of the Ordnance corps; I have two returns, one including the Ordnance corps and the other without it, but I take it irrespective of the Ordnance corps, as they have their own fixed establishment of generals, and therefore, although of course the promotion in the Ordnance corps might affect command, yet still it does not affect future promotion. Now, for instance, if the rule was altered, and those officers were antedated, Colonel Garvock would be benefited by 28, and so I have prepared the list, showing who would be injured and who would be benefited by the alteration. The case of Colonel Frazer is the case of an officer who retired from the 43d regiment; he did command the regiment, but had not served three years in that capacity, and therefore he was passed over by 62. Macqueen will be benefited by 65. In the case of Colonel Sparks, who was promoted in the last Gazette, he was rather low down in the list, and he had completed his three years in command of a regiment; he will be benefited by the alteration by as many as 89, but it varies between from 30 to 50, speaking of the benefit that it would be, while on the other hand the injury that would be inflicted on those already promoted would vary from one to about 37; that is, the senior Colonel, Jones, will be injured by one, because he only passed over one, whereas Colonel White at the bottom of the list of this number of lieutenant-colonels, promoted before the 20th of June 1854, would be injured by 37.

83. The latter half of the question was, what would have been the effect upon those who had been promoted, and who would now be repassed by those whom they had passed over; do you consider that they would have a grievance?—I cannot say that they would not consider it a grievance, but there could be no grievance in doing justice to officers who have suffered through (allow me to say) the operation of the warrant, and which I believe never to have been intended.

84. (*Sir W. F. Williams.*) Do you not mean an imaginary grievance?—No, the grievance in its effects would be substantial; I cannot but acknowledge that if officers are put back there may be a little substantial grievance, but the whole arguments of the Commissioners of 1854 go to prove that they never intended this injury to be inflicted.

85. (*Chairman.*) How do you establish that?—I found that remark upon part of the 52nd paragraph of the Report, and upon the 53rd paragraph.

86. Be good enough to read those paragraphs?—The 52d is, "We have hitherto considered the question before "us only with reference to the permanent system of pro- "motion to be established. We are, however, aware that "if this were at once substituted for that which has hitherto "been in force, without adopting some means to protect "the interests of those whose prospects would be affected "by the change, much injustice would be inflicted on many "officers who have relied on the continuance of the present "regulations. We are of opinion that a liberal view ought "to be taken of the claims of these officers, and that in "introducing a change, which the public good requires, "they ought to be carefully protected from injury and from "having their just expectations disappointed. We should "therefore humbly recommend to Your Majesty, that "before our suggestions are adopted, should they meet "with Your Majesty's approbation, a general brevet should "be granted; and also that the regulation we have pro- "posed, limiting the advancement of lieutenant-colonels to "the rank of colonel to those only who shall have served "three years in command of a regiment or in staff situa- "tions, as already described, should not apply to existing "lieutenant-colonels or majors including captains and "lieutenant-colonels of the guards." Then the 53rd paragraph goes on to say, "Should these suggestions meet with "Your Majesty's approval, as the number of general "officers would be raised by a brevet above the fixed "establishment we have proposed, we would further re- "commend that every third vacancy only in the general "officers' list should be filled up by the promotion of the "senior colonel, until the excess so created had been got "rid of. With regard to the manner and the numbers in "which existing field officers should from time to time, or "as vacancies occur in the major-general's list, be advanced "to the rank of colonel; we think this is a question which "may most conveniently be left for the consideration of "Your Majesty's servants. It is sufficient that we should "express our opinion that the principle to be followed "ought to be that of not disappointing, so far as it is pos- "sible to avoid it, the fair expectations of these officers, "and of providing for their obtaining without additional "delay that promotion which they would have obtained "under the present system."

87. That brevet was given in consequence of the recommendation?—Yes, I suppose it was, but at the same time the list of generals was at that time so low, the war then commencing, that whether the Commission had sat or not, I apprehend that in justice to the army, and perhaps following the precedent of former times, a brevet must have been given.

88. If it be true that there was great difficulty in getting that brevet, would that change your opinion?—No.

89. In your 115 you do not include any officers who were made lieutenant-colonels in that brevet?—No. I have taken all those who were lieutenant-colonels before that.

90. As I understand you, your proposal is, both in the case of those officers who had not been promoted under the warrant of 1854 and those who first being passed over subsequently were promoted, to restore all to their original position?—Yes, exactly so.

91. (*The Duke of Cambridge.*) Would you put any of those officers over some of those who had gained their promotion by three years' service?—Yes.

92. Then, in point of fact, of those officers who had gained their promotion according to the warrant by having the command of a regiment, or by holding a staff appointment, many of them would occupy a less advantageous position than they at present hold?—Yes, some of them, but not many; the difference to them is not very great, but some who apparently would be benefited will upon investigation be found not to be benefited; they would be slightly injured by putting them back to where they were.

93. (*Chairman.*) You have been looking very closely into the operation of these rules; now, putting aside the case of the vested interest of those officers, and assuming that all you wish is done, under the future operation of the warrant of 1854, will the major-generals be younger than they are now, taking the average deaths at about 20?—I have a list here with regard to the deaths since 1830, showing the number of generals who have died in each year, and also the date of each brevet, and the number promoted under each brevet and the number promoted since. It includes each brevet since 1830, including the brevets that now take place every year.

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94. (*The Duke of Cambridge.*) You mean to say the promotions that take place every year?—Yes.

95. (*Chairman.*) Will you state your opinion whether, so far as you can see, the mortality continuing as it does now, major-generals will, under the future operation of the warrant of 1854, arrive at that rank at a lower age than they have hitherto done?—Yes. I think, looking at the lists, that they will, but they are very much mixed, of course. I think if you could keep up a supply—it depends upon that—of 25 or even 20, but 25 would be better, that in the next five years there is a fair prospect of having a sufficiency of major-generals to do the work. I may state to the Commission, that as far as average service is concerned, which is not always a fair criterion, there seems to have been a turning point. I think we have got to the extreme. I think the average service is rather descending now. Younger officers are promoted now more than they were before. The average service of those who were promoted to the rank of major-general in 1846 was 45 years; in 1851 it was 44; in 1854, excluding those who were promoted by selection in 1854, it was 43; the number who were promoted after the brevet of 1854 is not a fair criterion, because there were seven or eight officers who were promoted for distinguished service. In 1855 it was 39 years; in 1856 it was 39, and in 1857 it rose to 42. The average service of all major-generals who were promoted to that rank since June 1854 was 37 years.

96. (*Colonel Eyre.*) Did you intend to state, referring to those officers who were benefited at the expense of their seniors, that putting their seniors into their original places would be any grievance to them?—No. Perhaps I did not explain myself, and I may correct that by saying that perhaps a grievance might be made of it, but I think that the grievance would not be a well-founded one.

97. (*Chairman.*) Have they not derived a certain advantage from the warrant issued by the Queen?—Certainly.

98. Then will it not be a disappointment to them at any rate to find that that advantage after four years is to be taken away from them?—I cannot deny that they may suffer disappointment, but if the Commissioners will recollect, the former Commission particularly held forth that the just expectations of the officers I have adverted to ought not to be disappointed.

99. Take the case of an officer now on the list of colonels within a certain distance from the rank of major-general, will not his just expectations be disappointed if he loses the position which he acquired by the warrant?—I cannot deny that he may suffer disappointment, but I think that it was the intention that the others should not be disappointed.

100. (*Lord Rokeby.*) Are there not cases of major-generals who are so affected by that warrant as to destroy the claim they had under the warrant of May 1825?—Yes, I think that I have heard of two. I do not know how many there are, but it is a peculiar instance, and is not a usual instance. When officers go upon half-pay it is generally by their own option that they do so, but that general order of April 1825 rather requested them to go on half-pay for the benefit of the service, and those officers who went on half-pay under that warrant are upon the half-pay of their former regimental rank.

101. (*Chairman.*) Therefore their grievance is the six years' rule?—Yes, those men were promoted after this warrant was issued, and the grievance is perpetuated in this warrant.

Adjourned.

LONDON:
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Printers to the Queen's most Excellent Majesty,
For Her Majesty's Stationery Office.

# REPORT

ON THE

# DISCIPLINE AND MANAGEMENT

OF THE

# MILITARY PRISONS,

## 1862.

By GEORGE V. R. DUNBAR, Esq.

Presented to both Houses of Parliament by Command of Her Majesty.

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1863.

[*Price 2d.*]

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# REPORT

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1862.

By George V. R. Dunbar, Esq.

*Presented to both Houses of Parliament by Command of Her Majesty.*

TO THE RIGHT HON. EARL DE GREY AND RIPON
SECRETARY OF STATE FOR WAR, &c.

War Office,
My Lord, 24th July 1863.

## Military Prisons for the Year 1862.

The same military prisons were in operation in 1862 as in the previous year. In March 1856 a temporary establishment was formed at Aldershot to provide for prisoners from the camp until the new prisons which were then about to be erected could be completed.

It is to be regretted that this temporary arrangement has continued from year to year. Though it is as well organized as circumstances will permit, and has ever been in excellent order, there do not exist there any adequate means for properly enforcing a sentence of imprisonment.

An admirable site has been selected in the neighbourhood of Reigate, on which it has been proposed to erect a large Central Military Prison for the accommodation of prisoners from Aldershot and the adjacent districts; for it must be borne in mind that the average force of the army in Great Britain and Ireland, which in 1847, when the accommodation was settled, amounted to

67,000 men, has reached during the last five years the following strength, namely:—

| | | | | |
|---|---|---|---|---|
| In 1858 | - | - | - | 100,169 |
| In 1859 | - | - | - | 105,248 |
| In 1860 | - | - | - | 105,157 |
| In 1861 | - | - | - | 93,467 |
| In 1862 | - | - | - | 85,395 |

The erection of the Central Prison at Reigate is therefore urgently required, for there can be no question that the discipline of the army has been prejudiced by the delay in making proper provision for the punishment of offenders. In the meantime a new temporary Military Prison, capable of accommodating 150 prisoners, is about to be opened at Southwark.

---

The Military Prisons in operation in 1862 were as follows:

| | |
|---|---|
| England ..... | Chatham, Gosport, Weedon, Devonport, Aldershott. |
| Scotland ..... | Greenlaw (near Edinburgh). |
| Ireland ..... | Dublin, Cork, Limerick, Athlone. |
| Abroad ..... | Gibraltar, Quebec, Halifax (Nova Scotia), Montreal, St. Elmo (Malta), Vido (Ionian Islands), Bermuda, Mauritius, and Barbadoes. |

Making a total of 19 Military Prisons, of which 10 are in the United Kingdom, and 9 at different foreign stations, the whole being capable of accommodating about 1,800 prisoners (see page 6).

---

## *Statistics of the Military Prisons.*

The following are the principal statistics of the ten Military Prisons at home for the last ten years :—

| | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. |
|---|---|---|---|---|---|---|---|---|---|---|
| Total number of prisoners admitted | 3,331 | 3,307 | 5,322 | 6,376 | 5,572 | 6,488 | 6,348 | 6,719 | 6,124 | 5,341 |
| Proportion per cent. of these admissions to the force | 4·47 | 4·78 | 4·48 | 6·84 | 5·62 | 5·97 | 6·4 | 4·08 | 6·56 | 6·28 |
| Daily average number of prisoners in confinement throughout the year | 570 | 504 | 562 | 896 | 744 | 931 | 837 | 1,101 | 1,084 | 972 |
| Proportion per cent. of the average numbers in confinement to the force | 0·76 | 0·73 | 0·47 | 1·24 | 1·91 | 0·86 | 0·79 | 0·67 | 1·16 | 1·39 |
| Average length of sentences | 92 days | 87 days | 77 days | 53 days | 49 days | 53 days | 48 days | 60 days | 57 days | 66 days |
| Punishments inflicted by Visitors for serious offences, *viz.*— | | | | | | | | | | |
| Corporal punishments | 6<br>238 lashes | 4<br>125 lashes | 5<br>175 lashes | 14<br>447 lashes | 5<br>200 lashes | 14<br>540 lashes | 7<br>300 lashes | 21<br>800 lashes | 20<br>810 lashes | 15<br>613 lashes |
| Sentenced to solitary confinement | 17 | 10 | 6 | 27 | 12 | 62 | 20 | 30 | 17 | 23 |
| Sentenced to separate confinement | 9 | 4 | 9 | 9 | 3 | 35 | 7 | 17 | 26 | 22 |
| Sentenced to be put in irons | 2 | 1 | 1 | — | — | 2 | — | 2 | — | — |

The following is a statement of the ages, services, country, and religion of the prisoners admitted in the years 1853—1862 inclusive :—

| | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Ages.** | | | | | | | | | | |
| Under 20 years | 621 | 962 | 1,577 | 1,436 | 723 | 1,534 | 1,393 | 1,095 | 844 | 511 |
| From 20 to 30 | 2,189 | 1,937 | 3,185 | 4,286 | 4,339 | 4,464 | 4,470 | 5,074 | 4,706 | 4,160 |
| „ 30 to 40 | 487 | 395 | 528 | 630 | 488 | 463 | 457 | 522 | 553 | 650 |
| Above 40 | 34 | 13 | 32 | 24 | 22 | 27 | 28 | 28 | 21 | 20 |
| | 3,331 | 3,307 | 5,322 | 6,376 | 5,572 | 6,488 | 6,348 | 6,719 | 6,124 | 5,341 |
| **Services.** | | | | | | | | | | |
| 2yrs. and under | 986 | 1,580 | 3,902 | 4,139 | 1,958 | 3,727 | 4,154 | 3,524 | 2,418 | 1,260 |
| Under 7 years | 1,291 | 884 | 692 | 1,255 | 2,746 | 2,226 | 1,710 | 2,627 | 2,939 | 2,922 |
| From 7 to 14 | 813 | 636 | 512 | 729 | 663 | 370 | 335 | 398 | 577 | 935 |
| „ 14 to 21 | 211 | 193 | 188 | 234 | 194 | 158 | 137 | 153 | 173 | 206 |
| Above 21 | 30 | 14 | 28 | 19 | 11 | 7 | 12 | 17 | 17 | 18 |
| | 3,331 | 3,307 | 5,322 | 6,376 | 5,572 | 6,488 | 6,348 | 6,719 | 6,124 | 5,341 |
| **Country.** | | | | | | | | | | |
| English | 1,902 | 1,817 | 2,983 | 3,694 | 3,422 | 3,944 | 3,805 | 3,927 | 3,613 | 3,259 |
| Scotch | 424 | 342 | 557 | 649 | 438 | 592 | 516 | 490 | 512 | 362 |
| Irish | 1,005 | 1,148 | 1 742 | 2,038 | 1,712 | 1,952 | 2,027 | 2,302 | 1,999 | 1,720 |
| | 3,331 | 3,307 | 5,322 | 6,376 | 5,572 | 6,488 | 6,348 | 6,719 | 6,124 | 5,341 |
| **Religion.** | | | | | | | | | | |
| Protestant | 1,937 | 2,028 | 3,263 | 3,996 | 3,600 | 3,925 | 3,790 | 3,892 | 3,551 | 3,156 |
| Presbyterian | 468 | 247 | 344 | 415 | 338 | 462 | 390 | 435 | 448 | 365 |
| Roman Catholic | 926 | 1,032 | 1,715 | 1,965 | 1,634 | 2,101 | 2,168 | 2,392 | 2,125 | 1,820 |
| | 3,331 | 3,307 | 5,322 | 6,376 | 5,572 | 6,488 | 6,348 | 6,719 | 6,124 | 5,341 |

The following table shows the comparative character of the prisoners for the last ten years:—

| Prison Character. | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. |
|---|---|---|---|---|---|---|---|---|---|---|
| Good . . | 3,088 | 3,072 | 5,020 | 6,043 | 5,353 | 5,886 | 5,542 | 6,081 | 5,559 | 5,007 |
| Indifferent . | 167 | 146 | 182 | 189 | 124 | 222 | 310 | 272 | 225 | 116 |
| Bad . . | 76 | 89 | 120 | 144 | 95 | 380 | 496 | 366 | 340 | 218 |
| | 3,331 | 3,307 | 5,322 | 6,376 | 5,572 | 6,488 | 6,348 | 6,719 | 6,124 | 5,341 |

The following is a statement of the number of punishments inflicted by Governors of Military Prisons in the United Kingdom for minor offences in the years 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, and 1862:—

| | 1853. | | 1854. | | 1855. | | 1856. | | 1857. | | 1858. | | 1859. | | 1860. | | 1861. | | 1862 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of Prisoners in confinement during the Year. | Number of Punishments for minor Offences. | Number of Prisoners in confinement during the Year. | Number of Punishments for minor Offences. | Number of Prisoners in confinement during the Year. | Number of Punishments for minor Offences. | Number of Prisoners in confinement during the Year. | Number of Punishments for minor Offences. | Number of Prisoners in confinement during the Year. | Number of Punishments for minor Offences. | Number of Prisoners in confinement during the Year. | Number of Punishments for minor Offences. | Number of Prisoners during the Year. | Number of Punishments for minor Offences. | Number of Prisoners in confinement during the Year. | Number of Punishments for minor Offences. | Number of Prisoners. | Number of Punishments. | Number of Prisoners in confinement during the Year. |
| Aldershott . | .. | .. | .. | .. | .. | .. | 1,066 | 122 | 836 | 148 | 1649 | 423 | 1,632 | 443 | 2,034 | 628 | 2,138 | 621 | 1898 |
| Fort Clarence | 962 | 556 | 1,131 | 629 | 1,592 | 303 | 1,622 | 309 | 1,395 | 139 | 1585 | 155 | 1,463 | 207 | 1,375 | 169 | 1,243 | 167 | 1095 |
| Gosport . . | 761 | 556 | 745 | 586 | 1,073 | 643 | 1,121 | 253 | 1,008 | 212 | 1079 | 270 | 1,108 | 401 | 1,156 | 261 | 1,227 | 130 | 1105 |
| Weedon . . | 426 | 64 | 338 | 28 | 715 | 39 | 666 | 41 | 529 | 39 | 877 | 80 | 798 | 74 | 702 | 56 | 543 | 36 | 556 |
| Devonport . | 228 | 298 | 197 | 202 | 204 | 183 | 260 | 273 | 205 | 197 | 245 | 320 | 223 | 275 | 275 | 602 | 229 | 434 | 243 |
| Greenlaw . | 275 | 210 | 263 | 169 | 390 | 415 | 345 | 352 | 191 | 151 | 334 | 306 | 326 | 331 | 327 | 164 | 301 | 157 | 190 |
| Dublin . . | 518 | 134 | 515 | 143 | 831 | 325 | 972 | 433 | 741 | 222 | 693 | 370 | 707 | 265 | 693 | 170 | 545 | 170 | 495 |
| Cork . . . | 363 | 95 | 410 | 117 | 404 | 151 | 493 | 139 | 356 | 95 | 445 | 203 | 518 | 457 | 518 | 111 | 443 | 26 | 265 |
| Limerick . | 183 | 141 | 172 | 128 | 339 | 217 | 376 | 109 | 102 | 15 | 138 | 137 | 270 | 466 | 269 | 286 | 203 | 180 | 180 |
| Athlone . . | 233 | 476 | 126 | 157 | 262 | 343 | 359 | 555 | 209 | 227 | 203 | 290 | 312 | 435 | 292 | 811 | 250 | 895 | 208 |
| | 3,949 | 2,530 | 3,897 | 2,159 | 5,810 | 2,619 | 7,280 | 2,586 | 5,572 | 1,447 | 7,248 | 2,554 | 7,357 | 3,354 | 7,641 | 3,258 | 7,122 | 2,816 | 6,235 |

The foregoing details exhibit a considerable variation in the prison statistics of 1862 as compared with those of the two previous years; the number of punishments for minor offences has diminished greatly during 1862. The average length of sentences was 99 days in 1849, and 87 in 1854, but it was reduced in 1855 to 77 days, in 1856 to 53 days, in 1857 to 49 days, in 1858 to 53 days, in 1859 and 1860 to 48 days, and in 1861 to 57 days. In 1862 it was 66 days.

### *Crimes.*

The following statement shows the extent of crimes as compared with the force from which offenders have been committed in the years from 1847 to 1862:—

| — | Average Force. | Desertion. | | Absence without Leave. | | Drunkenness. | | Disgraceful Conduct. | | Other Crimes. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Nos. | Per-centage. | Nos. | Per-centage. | Nos. | Per-centage. | Nos. | Per-centage. | Nos. | Per-centage. |
| 1847 | 67,069 | 1,481 | 2·20 | 823 | 1·22 | 703 | 1·04 | 187 | 0·27 | 656 | 0·97 |
| 1848 | 81,456 | 1,431 | 1·75 | 822 | 1·00 | 851 | 1·04 | 200 | 0·24 | 705 | 0·86 |
| 1849 | 65,897 | 970 | 1·45 | 977 | 1·48 | 795 | 1·20 | 153 | 0·23 | 638 | 0·96 |
| 1850 | 70,345 | 792 | 1·14 | 1,155 | 1·64 | 935 | 1·32 | 116 | 0·16 | 567 | 0·80 |
| 1851 | 69,968 | 642 | 0·91 | 1,115 | 1·59 | 879 | 1·25 | 98 | 0·14 | 532 | 0·76 |
| 1852 | 72,499 | 745 | 1·02 | 1,010 | 1·39 | 909 | 1·25 | 136 | 0·18 | 513 | 0·70 |
| 1853 | 74,476 | 1,069 | 1·43 | 830 | 1·11 | 778 | 1·04 | 111 | 0·14 | 543 | 0·72 |
| 1854 | 69,162 | 1,384 | 2·00 | 813 | 1·18 | 459 | 0·66 | 158 | 0·23 | 460 | 0·66 |
| 1855 | 118,717 | 2,441 | 2·05 | 1,201 | 1·01 | 593 | 0·49 | 275 | 0·23 | 812 | 0·68 |
| 1856 | 72,107 | 2,434 | 3·38 | 1,706 | 2·26 | 809 | 1·12 | 379 | 0·52 | 1,048 | 1·45 |
| 1857 | 76,360 | 1,888 | 2·48 | 1,734 | 2·27 | 619 | 0·82 | 277 | 0·37 | 1,038 | 1·37 |
| 1858 | 100,169 | 3,100 | 3·09 | 1,411 | 1·41 | 529 | 0·53 | 245 | 0·25 | 1,203 | 1·21 |
| 1859 | 105,248 | 2,774 | 2·17 | 1,426 | 1·36 | 636 | 0·61 | 251 | 0·24 | 1,261 | 1·19 |
| 1860 | 105,157 | 2,799 | 2·66 | 1,566 | 1·49 | 779 | 0·75 | 206 | 0·19 | 1,369 | 1·31 |
| 1861 | 93,467 | 2,432 | 2·61 | 1,279 | 1·37 | 736 | 0·79 | 222 | 0·24 | 1,455 | 1·56 |
| 1862 | 85,395 | 1,680 | 1·97 | 1,325 | 1·56 | 894 | 1·47 | 167 | 0·19 | 1,275 | 1·49 |

The above table shows that crime in the army has not been on the increase during the year 1862.

### *Expenditure.*

The following is a statement of the expenditure on account of the Military Prisons during the last thirteen years:—

| Expenses incurred. | 1850. | 1851. | 1852. | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ |
| The total charge for pay and allowances of prison officers, and for the subsistence and washing of the prisoners, was | 13,291 | 12,451 | 12,598 | 13,488 | 14,359 | 15,933 | 18,746 | 18,232 | 18,125 | 19,849 | 21,624 | 22,431 | 22,359 |
| The full pay and beer money of prisoners in confinement not issued amounted to | 13,738 | 11,329 | 11,390 | 11,925 | 9,999 | 13,868 | 18,722 | 16,008 | 19,577 | 21,959 | 23,225 | 23,359 | 21,200 |

### *Garrison and Barrack Cells.*

In the foregoing details the offences which have led to imprisonment in the Military Prisons at home have been noticed; the following statement, which shows in addition the average occupation in the Garrison and Barrack Cells in Great Britain and Ireland for minor offences, will afford a more complete view

of the state of Military Offences in the United Kingdom since 1847:—

| | Average Number daily of Prisoners in Military Prisons. | Proportion per cent. to the Force. | Average Number of Prisoners in Barrack Cells. | Proportion per cent. to the Force. | Total Average in Military Prisons and Barrack Cells. | Proportion per 1,000 to the Force. |
|---|---|---|---|---|---|---|
| 1847 | 672 | 1·00 | 242 | 0·44 | 914 | 14·4 |
| 1848 | 784 | 0·96 | 334 | 0·50 | 1,118 | 14·6 |
| 1849 | 750 | 1·13 | 275 | 0·42 | 1,023 | 15·5 |
| 1850 | 659 | 0·93 | 277 | 0·45 | 936 | 13·8 |
| 1851 | 550 | 0·78 | 249 | 0·43 | 799 | 12·1 |
| 1852 | 542 | 0·74 | 347 | 0·59 | 889 | 13·3 |
| 1853 | 570 | 0·76 | 211 | 0·32 | 781 | 10·8 |
| 1854 | 504 | 0·73 | 193 | 0·34 | 697 | 10·7 |
| 1855 | 562 | 0·47 | 269 | 0·22 | 831 | 6·9 |
| 1856 | 896 | 1·24 | 100 | 0·13 | 996 | 11·04 |
| 1857 | 744 | 0·91 | 122 | 0·17 | 866 | 11·3 |
| 1858 | 931 | 0·93 | 239 | 0·24 | 1,170 | 11·9 |
| 1859 | 837 | 0·79 | 246 | 0·24 | 1,083 | 10·3 |
| 1860 | 1,101 | 1·05 | 196 | 0·19 | 1,297 | 12·4 |
| 1861 | 1,084 | 1·16 | 216 | 0·28 | 1,300 | 14·4 |
| 1862 | 972 | 1.14 | 191 | 0.23 | 1,163 | 13.7 |

It should be observed that the average number of prisoners in Barrack Cells, as above, includes all, whether by sentence of Regimental Courts-martial or by the award of Commanding Officers.

### *Corporal Punishment.*

The following table shows the numbers of convictions and of corporal punishments inflicted in 1845, the year previous to the establishment of Military Prisons, and during the last thirteen years:—

| | Average Effectives of the Army. | Number of Convictions. | Proportion per cent. to Effectives. | Number of Corporal Punishments. | Proportion per cent. to Effectives. | Numbers marked as Deserters. | Proportion per cent. to Effectives. |
|---|---|---|---|---|---|---|---|
| 1845 | 125,252 | 9,954 | 7·94 | 652 | 0·52 | 786 | ·62 |
| 1850 | 125,119 | 9,640 | 7·7 | 247 | 0·19 | 605 | 0·48 |
| 1851 | 113,844 | 7,954 | 6·98 | 175 | 0·15 | 414 | 0·36 |
| 1852 | 117,643 | 8,312 | 7·06 | 282 | 0·23 | 427 | 0·36 |
| 1853 | 117,953 | 7,933 | 6·72 | 391 | 0·33 | 452 | 0·38 |
| 1854 | 135,884 | 6,051 | 4·82 | 435 | 0·32 | 396 | 0·29 |
| 1855 | 213,166 | 16,184 | 7·59 | 2,217 | 1·04 | 1,517 | ·71 |
| 1856 | 158,476 | 8,368 | 5·28 | 224 | 0·14 | 1,283 | 0·81 |
| 1857 | 163,468 | 12,265 | 7·50 | 545 | 0·34 | 1,290 | 0·76 |
| 1858 | 219,739 | 18,433 | 8·4 | 918 | 0·42 | 2,371 | 1·09 |
| 1859 | 234,186 | 19,262 | 8·3 | 772 | 0·33 | 2,642 | 1·13 |
| 1860 | 228,824 | 17,318 | 7·58 | 651 | 0·29 | 1,870 | 0·82 |
| 1861 | 212,295 | 18,483 | 8·7 | 413 | 0·15 | 2,211 | 1·05 |
| 1862 | 212,718 | 15,445 | 7·3 | 368 | 0·18 | 1,492 | 0·71 |

From these statistics it appears that in 1862 there has been a considerable decrease in the number of convictions, and of cases of desertion.

### *Re-committals.*

The following is a statement of the number of prisoners committed during the years 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, and 1862 who had at any time previously been committed to a Military Prison, showing their ages, services, &c.:—

| | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. |
|---|---|---|---|---|---|---|---|---|---|---|
| JES. | | | | | | | | | | |
| der 20 | 74 | 119 | 166 | 210 | 133 | 164 | 244 | 222 | 157 | 96 |
| rs. 30 yrs. | 921 | 591 | 479 | 1,019 | 1,173 | 1,003 | 1,322 | 1,861 | 1,954 | 1,907 |
| 40 yrs. | 296 | 187 | 157 | 250 | 237 | 206 | 221 | 284 | 293 | 329 |
| ve 40 s. | 21 | 9 | 6 | 12 | 5 | 11 | 19 | 13 | 16 | 9 |
| | 1,312 | 906 | 808 | 1,491 | 1,548 | 1,384 | 1,806 | 2,380 | 2,425 | 2,341 |
| NTRY. | | | | | | | | | | |
| lish . | 707 | 477 | 488 | 839 | 930 | 819 | 1,118 | 1,388 | 1,331 | 1,331 |
| ch . | 195 | 93 | 72 | 146 | 133 | 106 | 227 | 138 | 193 | 158 |
| h . . | 410 | 336 | 248 | 506 | 485 | 459 | 461 | 855 | 851 | 802 |
| . . | 312 | 906 | 808 | 1491 | 1,548 | 1,384 | 1,806 | 2,380 | 2,425 | 2,341 |

| | | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860 | 1861. | 1862. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SERVICES | | | | | | | | | | | |
| 2 yrs. and under . | | 128 | 192 | 355 | 713 | 253 | 408 | 836 | 748 | 551 | 250 |
| 7 years . | | 571 | 288 | 172 | 355 | 786 | 671 | 729 | 1,339 | 1,442 | 1,481 |
| 7 to 14 yrs. | | 471 | 314 | 207 | 315 | 309 | 212 | 167 | 187 | 320 | 493 |
| 14 to 21 yrs. | | 127 | 105 | 64 | 98 | 94 | 88 | 63 | 99 | 105 | 109 |
| Above 21 years . | | 15 | 7 | 10 | 10 | 6 | 5 | 11 | 7 | 7 | 8 |
| | | 1,312 | 906 | 808 | 1,491 | 1,548 | 1,334 | 1,806 | 2,380 | 2,425 | 2,341 |
| RELIGION. | | | | | | | | | | | |
| Protestant | | 773 | 551 | 515 | 904 | 971 | 831 | 1,125 | 1,409 | 1,368 | 1,324 |
| Presbyterian . | | 172 | 65 | 46 | 93 | 105 | 73 | 88 | 116 | 161 | 160 |
| Roman Catholic | | 367 | 290 | 247 | 494 | 472 | 480 | 593 | 855 | 896 | 857 |
| | | 1,312 | 906 | 808 | 1,491 | 1,548 | 1,384 | 1,806 | 2,380 | 2,425 | 2,341 |
| Crimes of which convicted at various times by the above re-committals | Desertion . . . . . | 514 | 417 | 370 | 580 | 650 | 625 | 893 | 1,162 | 1,172 | 1,583 |
| | Absence without Leave . . . | 1,381 | 783 | 572 | 1,106 | 1,264 | 1,055 | 1,320 | 1,836 | 1,977 | 1,994 |
| | Drunkenness . . . . . | 1,370 | 741 | 512 | 1,035 | 1,090 | 798 | 826 | 1,108 | 1,361 | 1,537 |
| | Disgraceful Conduct . . . | 70 | 38 | 50 | 111 | 108 | 70 | 72 | 143 | 148 | 118 |
| | Other Crimes . . . . . | 623 | 595 | 333 | 619 | 593 | 499 | 734 | 1,187 | 1,270 | 1,247 |
| | | 3,958 | 2,574 | 1,837 | 3,451 | 3,705 | 3,047 | 3,845 | 5,436 | 5,928 | 6,479 |
| State of Instruction | Could not read . . . . | 269 | 248 | 238 | 435 | 427 | 424 | 573 | 728 | 653 | 531 |
| | Could not write . . . . | 360 | 296 | 290 | 517 | 531 | 326 | 701 | 879 | 816 | 641 |

In this statement is included every soldier who having at any one time been committed to a Military Prison at home or abroad since 1845, when these establishments first came into operation, has again been committed to a Military Prison.

As from the statement showing the crimes for which men have been committed during the year, so from this it appears that absence without leave, drunkenness, and desertion are the prevailing crimes leading to re-committals.

In order, however, to arrive at an accurate judgment of the increase or decrease of re-committals in each year, it is necessary to compare the number of such annual re-committals with the aggregate number of prisoners who have been committed to the Military Prisons since they were first established in 1845.

The following statement shows the number of men committed in 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861 and 1862, who have at any time since 1845 been previously committed to any Military Prison; also the numbers re-committed to the same Military Prisons, and the total number of admissions since 1845:—

| | 1853. | | | 1854. | | | 1855. | | | 1856. | | | 1857. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. |
| Aldershott | . . | . . | . . | . . | . . | . . | . . | . . | . . | 391 | 28 | 1,066 | 322 | 44 | 1,905 |
| Fort Clarence | 282 | 63 | 7,405 | 215 | 54 | 8,376 | 235 | 190 | 9,820 | 316 | 261 | 11,244 | 301 | 251 | 12,639 |
| Gosport | 242 | 128 | 5,427 | 129 | 63 | 6,046 | 126 | 91 | 7,031 | 245 | 165 | 7,997 | 327 | 138 | 9,005 |
| Weedon | 202 | 30 | 3,563 | 116 | 26 | 3,823 | 114 | 13 | 4,489 | 78 | 34 | 5,036 | 75 | 31 | 5,565 |
| Devonport | 71 | 28 | 1,552 | 58 | 16 | 1,714 | 30 | 16 | 1,899 | 64 | 39 | 2,126 | 91 | 28 | 2,331 |
| Greenlaw | 86 | 18 | 1,753 | 62 | 23 | 1,968 | 46 | 16 | 2,307 | 42 | 25 | 2,592 | 40 | 18 | 2,783 |
| Dublin | 149 | 21 | 4,565 | 130 | 21 | 5,037 | 130 | 32 | 5,816 | 175 | 33 | 6,708 | 216 | 35 | 7,449 |
| Cork | 119 | 43 | 3,105 | 104 | 33 | 3,467 | 50 | 24 | 3,824 | 80 | 20 | 4,265 | 101 | 40 | 4,621 |
| Limerick | 75 | 21 | 2,003 | 58 | 15 | 2,156 | 45 | 9 | 2,470 | 56 | 9 | 2,776 | 22 | 1 | 2,878 |
| Athlone | 86 | 42 | 1,481 | 34 | 15 | 1,574 | 32 | 7 | 1,827 | 64 | 19 | 2,144 | 53 | 11 | 2,353 |
| | 1,312 | 394 | 30,854 | 906 | 361 | 34,161 | 808 | 398 | 39,483 | 1,491 | 633 | 45,954 | 1,548 | 597 | 51,529 |
| Average of total Re-committals to number of Prisoners | per cent. 4·25 | . . | . . | per cent. 2·65 | . . | . . | per cent. 2·04 | . . | . . | per cent. 3·24 | . . | . . | per cent. 2·91 | . . | . . |
| Average of Re-committals to the same Prisons to the number of Prisoners | . . | per cent. 1·27 | . . | . . | per cent. 1·28 | . . | . . | per cent. 1·00 | . . | . . | per cent. 1·37 | . . | . . | per cent. 1·12 | . . |
| Increase compared with the previous year | . . | . . | . . | . . | . . | . . | . . | 37 | . . | 683 | 235 | . . | . . | 57 | . . |
| Decrease compared with the previous year | 112 | 69 | . . | 406 | 33 | . . | 98 | . . | . . | . . | . . | . . | . . | . . | . . |

| | 1858. | | | 1859. | | | 1860. | | | 1861. | | | 1862. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. | Total Number of Re-committals. | Number re-committed to the same Prison. | Number of Prisoners admitted to 31 Dec. |
| Aldershott | 430 | 96 | 3,425 | 616 | 142 | 4,876 | 888 | 275 | 6,696 | 969 | 313 | 8,550 | 899 | 285 | 10,175 |
| Fort Clarence | 284 | 257 | 14,022 | 339 | 310 | 15,315 | 876 | 318 | 16,531 | 363 | 302 | 17,588 | 318 | 229 | 18,516 |
| Gosport | 251 | 165 | 9,978 | 252 | 161 | 10,917 | 373 | 238 | 11,942 | 413 | 226 | 13,018 | 410 | 258 | 13,999 |
| Weedon | 76 | 25 | 6,327 | 124 | 58 | 6,973 | 127 | 53 | 7,584 | 135 | 62 | 8,027 | 189 | 86 | 8,491 |
| Devonport | 53 | 24 | 2,553 | 59 | 13 | 2,740 | 76 | 27 | 2,984 | 73 | 73 | 3,202 | 64 | 29 | 3,422 |
| Greenlaw | 31 | 22 | 3,073 | 43 | 34 | 3,342 | 51 | 36 | 3,613 | 78 | 51 | 3,863 | 65 | 38 | 4,018 |
| Dublin | 118 | 38 | 8,064 | 142 | 22 | 8,669 | 209 | 26 | 9,268 | 147 | 5 | 9,716 | 160 | 18 | 10,131 |
| Cork | 73 | 36 | 5,023 | 109 | 61 | 5,480 | 129 | 89 | 5,912 | 109 | 58 | 6,276 | 99 | 57 | 6,501 |
| Limerick | 17 | 6 | 3,010 | 53 | 19 | 3,259 | 66 | 23 | 3,654 | 57 | 18 | 3,825 | 51 | 28 | 3,976 |
| Athlone | 51 | 11 | 2,542 | 64 | 31 | 2,794 | 100 | 40 | 3,060 | 81 | 30 | 3,303 | 86 | 24 | 3,479 |
| | 1,384 | 680 | 58,017 | 1,806 | 851 | 64,365 | 2,380 | 1,123 | 71,244 | 2,425 | 1,138 | 77,368 | 2,341 | 1,052 | 82,709 |
| Average of total Re-committals to number of Prisoners | per cent. 2·39 | . . | . . | per cent. 2·81 | . . | . . | per cent. 3.35 | . . | . . | per cent. 3·27 | . . | . . | per cent. 2·83 | . . | . . |
| Average of Re-committals to the same Prisons to the number of Prisoners | . . | per cent. 1·18 | . . | . . | per cent. 1·83 | . . | . . | per cent. 1.58 | . . | . . | per cent. 1·47 | . . | . . | per cent. 1·28 | |
| Increase compared with the previous year | . . | 83 | . . | 422 | 171 | . . | 574 | . . | . . | 45 | 15 | . . | . . | . . | |
| Decrease compared with the previous year | 168 | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | 84 | 86 | |

It might be expected, that as the aggregate number of soldiers who have been once committed must year by year increase for a considerable period after the first formation of Military Prisons, so the number of re-committals would multiply in a corresponding ratio. That this, however, has not been the case is shown by the decrease of the average of total re-committals compared with the total number of admissions into the Military Prisons in 1853.

### *Drunkenness.*

Drunkenness is, perhaps, the most fertile source of military crime; the number of committals for this offence has increased in the year 1862.

The following return will give the particulars for fifteen years, ending 1862:—

| — | England. | | | Scotland. | | | Ireland. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average Force. | No. of Committals for Drunkenness. | Per-centage. | Average Force. | No. of Committals for Drunkenness. | Per-centage. | Average Force. | No. of Committals for Drunkenness. | Per-centage. |
| 1848 . | 46,662 | 337 | 0·72 | 5,103 | 51 | 0·99 | 29,691 | 463 | 1·56 |
| 1849 . | 38,307 | 307 | 0·80 | 5,013 | 40 | 0·79 | 22,577 | 448 | 1·98 |
| 1850 . | 44,101 | 346 | 0·78 | 5,307 | 51 | 0·97 | 20,937 | 438 | 2·57 |
| 1851 . | 42,318 | 387 | 0·91 | 3,913 | 51 | 1·30 | 23,737 | 441 | 1·85 |
| 1852 . | 44,068 | 313 | 0·71 | 4,144 | 85 | 2·05 | 24,287 | 511 | 2·10 |
| 1853 . | 46,849 | 279 | 0·59 | 4,451 | 45 | 1·01 | 23,176 | 454 | 1·95 |
| 1854 . | 46,106 | 195 | 0·42 | 3,312 | 27 | 0·82 | 19,744 | 237 | 1·20 |
| 1855 . | 70,298 | 250 | 0·35 | 8,270 | 32 | 0·38 | 40,149 | 311 | 0·77 |
| 1856 . | 45,076 | 491 | 1·08 | 3,430 | 6 | 0·17 | 23,601 | 312 | 1·33 |
| 1857 . | 52,885 | 666 | 1·21 | 3,356 | 27 | 0·81 | 20,119 | 397 | 1.98 |
| 1858 . | 70,588 | 352 | 0·49 | 4,653 | 6 | 0·13 | 24,898 | 171 | 0·69 |
| 1859 . | 73,393 | 384 | 0·53 | 4,542 | 25 | 0·56 | 27,314 | 227 | 0·84 |
| 1860 . | 73,734 | 541 | 0·74 | 4,851 | 16 | 0·34 | 26,572 | 222 | 0·84 |
| 1861 . | 65,357 | 626 | 0·96 | 4,114 | 9 | 0·22 | 23,966 | 101 | 0·43 |
| 1862 . | 60,690 | 759 | 1·24 | 3,638 | 8 | 0·22 | 21,067 | 127 | 0·61 |

## *Health.*

AN ABSTRACT of the ANNUAL RETURNS of MEDICAL OFFICERS of MILITARY PRISONS at HOME.

| | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 186 |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of prisoners in confinement 1st Jan. | 618 | 590 | 488 | 904 | 837 | 760 | 1,009 | 922 | 994 | 8 |
| Number of prisoners admitted during the year. | 3,331 | 3,307 | 5,322 | 6,376 | 5,572 | 6,188 | 6,348 | 6,719 | 6,124 | 5,3 |
| | 3,949 | 3,897 | 5,810 | 7,280 | 6,409 | 7,248 | 7,357 | 7,641 | 7,122 | 6,2 |
| Discharged from Prison during the year | 3,359 | 3,409 | 5,002 | 6,443 | 5,659 | 6,244 | 6,437 | 6,586 | 6,283 | 5,3 |
| Remaining in confinement on 31st December | 590 | 509 | 808 | 837 | 750 | 1,004 | 920 | 1,055 | 839 | 9 |

| | 1850. | 1851. | 1852. | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of prisoners in confinement during the year | 4,283 | 3,897 | 3,811 | 3,949 | 3,879 | 5,810 | 7,280 | 6,409 | 7,248 | 7,357 | 7,641 | 7,122 | 6,2 |
| Of these the following were treated for sickness:— | | | | | | | | | | | | | |
| Remaining under treatment on 1st January | 22 | 37 | 16 | 18 | 21 | 19 | 23 | 26 | 19 | 20 | 20 | 26 | |
| Treated in the Sick Ward of the Prison | 267 | 280 | 177 | 168 | 123 | 206 | 297 | 179 | 313 | 235 | 281 | 255 | 2 |
| Treated in the Prison, but not in the Sick Ward | 787 | 673 | 693 | 544 | 605 | 518 | 821 | 742 | 612 | 666 | 683 | 532 | 4 |
| Treated in Garrison or Regimental Hospital | 37 | 45 | 78 | 71 | 66 | 114 | 125 | 125 | 165 | 73 | 74 | 50 | |
| | 1,113 | 1,035 | 964 | 801 | 815 | 857 | 1,266 | 1,072 | 1,109 | 994 | 1,058 | 863 | 7 |
| Of these were:— | | | | | | | | | | | | | |
| Discharged cured | 1,039 | 988 | 908 | 748 | 777 | 790 | 1,205 | 1,022 | 1,049 | 942 | 984 | 821 | 7 |
| Transferred to Hospital at the expiration of sentence | 36 | 25 | 35 | 28 | 18 | 40 | 35 | 35 | 38 | 29 | 46 | 26 | |
| Died in Garrison or Regimental Hospital | 1 | 3 | 2 | 2 | .. | 4 | .. | .. | 2 | .. | 2 | 1 | |
| Died in Prison | .. | 2 | 1 | 1 | 1 | 1 | 1 | 2 | .. | .. | 1 | 1 | |
| Remaining under treatment on 31st Dec. | 37 | 17 | 18 | 22 | 19 | 22 | 25 | 13 | 20 | 23 | 25 | 14 | |
| | 1,113 | 1,035 | 964 | 801 | 815 | 857 | 1,266 | 1,072 | 1,109 | 994 | 1,058 | 863 | 7 |
| The diseases were as follows:— | | | | | | | | | | | | | |
| Fevers | 50 | 47 | 27 | 28 | 20 | 18 | 24 | 34 | 56 | 52 | 35 | .. | |
| Diseases of the head and nervous system | 16 | 6 | 16 | 9 | 8 | 10 | 23 | 4 | 6 | 7 | 17 | .. | |
| „ heart and lungs | 103 | 137 | 132 | 102 | 62 | 111 | 181 | 152 | 141 | 110 | 141 | .. | |
| „ stomach and bowels | 207 | 260 | 165 | 159 | 227 | 95 | 213 | 204 | 130 | 148 | 134 | .. | |
| Rheumatic affections and colds | 70 | 69 | 71 | 49 | 22 | 29 | 71 | 41 | 48 | 47 | 38 | .. | |
| Venereal diseases | 149 | 97 | 136 | 88 | 76 | 145 | 214 | 202 | 173 | 171 | 170 | .. | |
| Diseases of the skin | 77 | 34 | 21 | 18 | 20 | 74 | 97 | 56 | 128 | 67 | 57 | .. | |
| Ulcers and abscesses | 210 | 217 | 214 | 197 | 190 | 198 | 210 | 201 | 244 | 226 | 305 | .. | |
| Diseases of the eyes | 45 | 32 | 30 | 23 | 34 | 25 | 55 | 24 | 38 | 27 | 34 | .. | |
| Wounds and accidents | 51 | 38 | 34 | 50 | 56 | 51 | 58 | 47 | 51 | 63 | 63 | .. | |
| Other diseases | 135 | 98 | 118 | 78 | 100 | 101 | 120 | 107 | 97 | 76 | 64 | .. | |
| | 1,113 | 1,035 | 964 | 801 | 815 | 857 | 1,266 | 1,072 | 1,109 | 994 | 1,058 | .. | |
| 1. Zymotic diseases: | | | | | | | | | | | | | |
| Miasmatic diseases | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 193 | 1 |
| Enthetic diseases | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 141 | 1 |
| Dietec diseases | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| Parasitic diseases | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 61 | |
| 2. Constitutional diseases: | | | | | | | | | | | | | |
| Diathetic diseases | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | |
| Tuberculer diseases | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 15 | |
| 3. Local diseases: | | | | | | | | | | | | | |
| Of the nervous system | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 17 | |
| „ circulatory system | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 | |
| „ respiratory system | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 88 | |
| „ digestive system | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 26 | |
| „ urinary system | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 5 | |
| „ reproductive system | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | |
| „ locomotive system | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | |
| „ integumentary system | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 228 | 1 |
| 4. Developmental diseases: | | | | | | | | | | | | | |
| Atrophia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | |
| 5. Violent deaths or diseases | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 77 | |
| | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 863 | 7 |
| The greatest number of prisoners in confinement at any one time was | 904 | 767 | 731 | 801 | 722 | 941 | 1,116 | 1,033 | 1,173 | 1,265 | 1,356 | 1,320 | 1,21 |
| The smallest number was | 413 | 362 | 374 | 369 | 307 | 396 | 649 | 412 | 668 | 779 | 812 | 791 | 6 |
| The daily average number was | 659 | 550 | 542 | 570 | 504 | 562 | 896 | 744 | 931 | 1,039 | 1,101 | 1,084 | 9 |
| The total number treated for sickness was. | 1,113 | 1,035 | 964 | 801 | 815 | 857 | 1,266 | 1,079 | 1,109 | 994 | 1,058 | 863 | 7 |
| The average daily sick was | 26 | 26 | .. | 19 | 19 | 22 | 26 | 18 | 27 | 22 | 25 | 23 | |
| The number of deaths was | 1 | 5 | 3 | 3 | 1 | 5 | 1 | 2 | 2 | .. | 3 | 2 | |

From the above abstract of the Medical Returns of the Military Prisons at home, it appears that the health of the prisoners during the year 1862 was satisfactory. It will be seen that the proportion of numbers treated for sickness to the total numbers in confinement in 1854 was nearly 21 per cent., whereas in 1855 it decreased to about 15 per cent.; in 1856 it was 17 per cent., in 1857 16 per cent., in 1858 15 per cent., in 1859 and 1860 it was only about 13 per cent., and in 1861 and 1862 about 12 per cent.

This result seems to prove that the improved system of prison diet in operation at Aldershot since August 1858, and introduced into all Military Prisons at home in September 1861, has had a beneficial sanitary effect.

*Comparison of the Health of the Prisoners with that of the Troops in Barracks.*

By Returns obtained from the Army Medical Department, showing the average strength of the Troops, the number of admissions into Hospital, and the number of deaths in the several Garrisons in which the Military Prisons at home are situated, during the years 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, and 1862, it appears that—

| | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. |
|---|---|---|---|---|---|---|---|---|---|---|
| an average strength of | 22,838 | 18,122 | 20,689 | 38,853 | 28,946 | 38,085 | 57,305 | 36,788 | 35,569 | 34,354 |
| admissions into Hos- | 19,892 | 19,728 | 19,019 | 33,323 | 21,644 | 37,912 | 40,997 | 42,810 | 33,181 | 31,948 |
| he deaths were . . | 223 | 189 | 223 | 170 | 172 | 293 | 269 | 322 | 289 | 198 |
| his gives | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. |
| io of admissions to the average strength of . . . | 87 | 108 | 92 | 85 | 74 | 99 | 71 | 114 | 107 | 93 |
| deaths „ | 0·97 | 1·44 | 1·08 | 0·44 | ·59 | 0·77 | 0·47 | 0·88 | 0·82 | 0·58 |
| deaths to admis- sions of . . | 1·12 | 0·96 | 1·17 | 0·51 | 0·79 | 0·78 | 0·66 | 0·76 | 0·76 | 0·62 |
| Statistics of the nine ilitary Prisons at home ow that— | | | | | | | | | | |
| an average strength of numbers treated for | 570 | 504 | 562 | 896 | 744 | 931 | 1,039 | 1,101 | 1,084 | 972 |
| ness were . . | 801 | 815 | 857 | 1,266 | 1,072 | 1,109 | 994 | 1,058 | 863 | 771 |
| he deaths were . . | 3 | 1 | 5 | 1 | 2 | 2 | .. | 3 | 2 | 3 |
| his gives— | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. |
| io of admissions to the average strength of . . | 140 | 162 | 152 | 146 | 144 | 119 | 95 | 96 | 79 | 79 |
| deaths „ | 0·52 | 0·20 | 0·80 | 0·11 | 0·27 | 0·22 | .. | 0·28 | 0·19 | 0·31 |
| deaths to admis- sions of . | 0·37 | 0·12 | 0·58 | 0·08 | 0·19 | 0·19 | .. | 0·29 | 0·24 | 0·39 |

As stated in previous Reports, there will always appear to be a large number of cases treated in the prisons in proportion to the average strength, in consequence of the continual admission and discharge of prisoners, and of their endeavours to escape a portion of their punishment by coming forward for treatment upon slight grounds.

Of the 863 prisoners treated in the Prisons at home during 1862, the greater part were not even placed in the sick ward; they were prisoners who came forward with slight ailments, for which the Medical Officer treated them without relieving them from the ordinary labour of the prison.

*Diet in Military Prisons.*

The following scale of diet for Military Prisoners was adopted in 1862,[5]

The diet of prisoners not engaged at hard labour is to be as follows at home stations:—

| | | |
|---|---|---|
| Breakfast | 8 oz. of oatmeal<br>½ pint of milk | Daily. |
| Dinner | 9 oz. of Indian meal<br>½ pint of milk | |
| Supper | 8 oz. of bread<br>½ pint of milk | |

And the following scale may be adopted for such prisoners after fifty-six days' confinement:—

Breakfast:—Oatmeal - - 10 oz.
Dinner:—Indian meal - - 12 oz.
Supper:—Bread - - 8 oz.
With ½ pint of milk to each meal.

Prisoners of the first class not engaged at hard labour shall be allowed a meat dinner, as detailed below, on Sundays.

The diet of prisoners in the second and third classes employed at hard labour shall be as follows on two days of the week, viz. Tuesday and Thursday, at home stations:—

| | | |
|---|---|---|
| Breakfast | 8 oz. of oatmeal<br>½ pint of milk | Daily. |
| Dinner | 8 oz. of beef, without bone, before cooking, 2 lbs. of potatoes or 8 oz. of bread, 1 pint of soup thickened with 1 oz. of oatmeal, and 2 oz. of vegetables per man, seasoned with pepper and salt | |
| Supper | 8 oz. of bread<br>½ pint of milk | |

On other days of the week it shall be the same as for prisoners not at hard labour. The first class shall be allowed an additional meat dinner on Sundays.

When it may be deemed necessary by the medical officer, for the health of a prisoner, to substitute occasionally bread for oatmeal or Indian meal, the following will be the proportion:—

10 oz. of bread in lieu of 8 oz. of oatmeal.
12 oz. „ „ 9 oz. of Indian meal.
8 oz. „ „ 6 oz. ditto.

If in solitary or close confinement for a prison offence, or placed on bread and water as a punishment:—

| | |
|---|---|
| 1 lb. of bread, with such quantity of water for drinking as a prisoner may desire to have, for the first three days of such confinement, which may, however, be extended to seven days, at the discretion of the Visitor; and for the remaining period the same diet as for prisoners not engaged at hard labour | Daily. |

A statement of the number of cases in which the extension beyond three days is awarded should be included in the Medical Officer's Quarterly Report.

The bread to be of the quality of ration bread.

On foreign stations the above scales of diet may also be used when deemed expedient; but if not, such diet only shall be used as may have received the sanction of the Secretary at War.

Every prisoner shall be allowed a meat dinner on Christmas Day.

TABLE showing the Number of Prisoners discharged who GAINED or LOST WEIGHT, from 1 to 27 lbs. each, during the years 1853 to 1862.

| Lbs. | Number of Men. Gained. | | | | | | | | | | Lost. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. |
| 1 | 60 | 109 | 198 | 238 | 212 | 294 | 448 | 332 | 323 | 314 | 134 | 174 | 328 | 384 | 370 | 382 | 521 | 505 | 449 | 486 |
| 2 | 36 | 78 | 135 | 148 | 134 | 222 | 301 | 273 | 286 | 265 | 154 | 215 | 469 | 479 | 466 | 488 | 561 | 570 | 488 | 394 |
| 3 | 13 | 44 | 72 | 108 | 97 | 140 | 193 | 215 | 180 | 207 | 188 | 230 | 434 | 512 | 521 | 518 | 598 | 564 | 542 | 400 |
| 4 | 11 | 21 | 45 | 81 | 64 | 101 | 124 | 123 | 149 | 131 | 206 | 243 | 474 | 597 | 551 | 546 | 535 | 527 | 564 | 377 |
| 5 | 13 | 16 | 40 | 46 | 29 | 72 | 81 | 99 | 105 | 75 | 200 | 248 | 453 | 507 | 466 | 508 | 513 | 520 | 512 | 801 |
| 6 | 10 | 11 | 16 | 39 | 30 | 47 | 44 | 60 | 52 | 82 | 251 | 249 | 400 | 469 | 608 | 486 | 452 | 453 | 435 | 220 |
| 7 | 3 | 4 | 9 | 31 | 26 | 31 | 32 | 47 | 56 | 57 | 256 | 235 | 311 | 450 | 404 | 408 | 384 | 401 | 407 | 262 |
| 8 | 6 | 10 | 4 | 16 | 10 | 11 | 25 | 24 | 44 | 39 | 195 | 212 | 282 | 385 | 324 | 334 | 279 | 339 | 332 | 158 |
| 9 | 3 | 1 | 5 | 6 | 10 | 8 | 12 | 12 | 15 | 31 | 208 | 173 | 223 | 343 | 303 | 282 | 225 | 298 | 285 | 115 |
| 10 | . | 4 | 5 | 9 | 5 | 8 | 14 | 14 | 14 | 27 | 201 | 180 | 204 | 269 | 218 | 222 | 149 | 176 | 154 | 166 |
| 1 | . | 3 | 1 | 3 | 5 | 3 | 10 | 12 | 12 | 13 | 169 | 135 | 128 | 201 | 159 | 178 | 121 | 174 | 132 | 83 |
| 12 | . | 1 | 1 | 4 | 1 | 4 | 5 | 9 | 13 | 12 | 141 | 124 | 114 | 148 | 117 | 143 | 94 | 107 | 97 | 50 |
| 13 | 1 | 10 | . | 3 | 3 | 3 | 3 | 4 | 5 | 17 | 109 | 117 | 79 | 117 | 94 | 95 | 55 | 63 | 48 | 33 |
| 14 | . | . | . | . | . | 2 | 3 | 5 | 4 | 11 | 122 | 95 | 82 | 107 | 78 | 46 | 56 | 62 | 37 | 24 |
| 15 | . | . | 1 | . | 1 | . | 1 | 2 | 2 | 12 | . | . | 37 | 54 | 44 | 53 | 26 | 31 | 25 | 18 |
| 16 | . | . | . | . | . | 1 | 1 | . | 5 | 4 | 95 | 65 | 35 | 45 | 29 | 23 | 17 | 17 | 16 | 11 |
| 17 | . | . | . | . | . | 1 | 1 | . | 1 | 1 | 8 | 41 | 25 | 42 | 17 | 16 | 16 | 19 | 14 | 7 |
| 18 | . | . | . | 1 | . | 3 | . | 1 | . | 3 | 61 | 44 | 16 | 22 | 21 | 14 | 8 | 15 | 1 | 4 |
| 19 | . | . | . | . | . | . | 1 | 1 | . | . | 4 | 38 | 14 | 20 | 12 | 8 | 7 | 9 | 4 | 6 |
| 20 | . | . | . | . | . | 1 | . | . | . | 2 | 4 | 22 | 8 | 15 | 5 | 12 | 2 | 4 | 4 | 2 |
| 21 | . | . | . | . | . | . | . | . | . | . | 3 | 9 | 8 | 6 | 4 | 6 | 3 | 3 | 1 | 1 |
| 22 | . | . | . | . | . | 1 | . | . | . | . | 32 | 14 | 2 | 5 | 6 | . | 1 | 2 | 1 | . |
| 23 | . | . | . | . | . | . | . | . | . | . | 31 | 13 | 5 | 6 | 3 | 4 | 1 | 1 | 1 | 3 |
| 24 | . | . | . | 1 | . | . | . | . | . | . | 1 | 7 | 2 | 5 | 2 | . | 1 | 1 | . | . |
| 25 | . | . | . | . | . | . | . | 1 | . | . | 18 | 5 | 6 | 5 | 1 | 3 | 1 | 2 | 1 | . |
| 26 | . | . | . | . | . | . | . | 1 | . | . | . | 18 | . | . | . | 2 | . | . | . | . |
| 27 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 156 | 312 | 532 | 734 | 627 | 953 | 1,299 | 1,240 | 1,266 | 1303 | 3,048 | 2,906 | 4,139 | 5,193 | 4,823 | 4,782 | 4,260 | 4,863 | 4,561 | 3,619 |

TABLE showing the GAINS and LOSSES of WEIGHT of MEN discharged from MILITARY PRISONS at HOME, during the Year 1862, with the NUMBER of MEN treated for SICKNESS, and the NUMBER of DEATHS, &c.

| PRISONS. | Numbers Discharged. | GAINED. | | | LOST. | | | Neither Gained nor Lost. | Not Weighed. | Number treated for Sickness during the Year. | Per-centage of Sick to average Strength. | Deaths. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number. | Lbs. | Average. | Number. | Lbs. | Average. | | | | | |
| | 1862. | 1862. | 1862. | 1862. | 1862. | 1862. | 1862. | 1862. | 1862. | 1862. | 1862. | 1862. |
| | | | | lbs. oz | | | lbs. oz. | | | | | |
| Fort Clarence | 910 | 227 | 846 | 3 8 | 613 | 3,040 | 5 0 | .. | .. | .. | .. | .. |
| Aldershott | 1,662 | 407 | 1,606 | 4 0 | 1,130 | 5,088 | 4 5 | .. | .. | .. | .. | .. |
| Gosport | 973 | 116 | 376 | 3 3 | 776 | 3,935 | 5 1 | .. | .. | .. | .. | .. |
| Weedon | 443 | 237 | 1103 | 4 7 | 144 | 542 | 3 8 | .. | .. | .. | .. | .. |
| Greenlaw | 155 | 32 | 125 | 4 0 | 111 | 447 | 4 3 | .. | .. | .. | .. | .. |
| Dublin | 403 | 138 | 592 | 4 3 | 257 | 1,372 | 5 4 | .. | .. | .. | .. | .. |
| Cork | 228 | 95 | 301 | 3 2 | 124 | 510 | 4 2 | .. | .. | .. | .. | .. |
| Limerick | 157 | 7 | 20 | 2 9 | 145 | 1,140 | 7 9 | . | .. | . | .. | .. |
| Devonport | 217 | 19 | 56 | 3 0 | 186 | 1,214 | 6 6 | .. | .. | .. | .. | .. |
| Athlone. | 163 | 25 | 78 | 3 2 | 133 | 879 | 6 7 | .. | .. | .. | .. | .. |
| Gross Total | 5,311 | 1,303 | 5,103 | 4 0 | 3,619 | 18,187 | 5 1 | 353 | 36 | 771 | 79 | 3 |
| General Average | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Numbers | .. | 1,303 | .. | .. | 3,619 | .. | .. | | .. | .. .. | .. | .. |
| Total Numbers | | | | | 5,311. | | | | | | | |

COMPARISON of GROSS TOTALS from 1850 to 1862.

| | GAIN. | | | LOST. | | | Neither Gained nor Lost. | Not Weighed. |
|---|---|---|---|---|---|---|---|---|
| | No. of Men. | Lbs. | Average. | No. of Men. | Lbs. | Average. | | |
| | | | lbs. oz. | | | lbs. oz. | | |
| 1850 | 504 | 1,587 | 3 2 | 2,800 | 19,630 | 6 12 | 226 | 32 |
| 1851 | 231 | 614 | 2 10 | 2,994 | 25,444 | 8 8 | 135 | 39 |
| 1852 | 180 | 575 | 3 3 | 2,884 | 27,194 | 9 7 | 87 | 42 |
| 1853 | 156 | 450 | 2 14 | 3,048 | 28,065 | 9 3 | 112 | 43 |
| 1854 | 304 | 862 | 2 13 | 2,952 | 22,299 | 7 9 | 164 | 42 |
| 1855 | 533 | 1,387 | 2 10 | 4,137 | 25,351 | 6 2 | 270 | 62 |
| 1856 | 734 | 2,294 | 3 4 | 5,193 | 33,538 | 6 3 | 308 | 208 |
| 1857 | 631 | 1,955 | 3 6 | 4,610 | 27,773 | 6 0 | 315 | 104 |
| 1858 | 953 | 2,923 | 2 13 | 4,782 | 28,987 | 6 1 | 399 | 110 |
| 1859 | 1,300 | 3,779 | 2 14 | 4,637 | 23,057 | 5 4 | 433 | 67 |
| 1860 | 1,239 | 4,195 | 3 5 | 4,861 | 27,334 | 5 9 | 416 | 70 |
| 1861 | 1,266 | 4,412 | 3 7 | 4,561 | 25,151 | 5 7 | 398 | 40 |
| 1862 | 1,303 | 5,103 | 4 0 | 3,619 | 18,187 | 5 1 | 353 | 36 |

The adoption of an improved scale of diet has considerably diminished the average loss of weight, and it is satisfactory that the number treated for sickness during the year 1862 was proportionately less than in any year since 1850 excepting 1861.

| | 1850. | 1851. | 1852. | 1853. | 1854. | 1855. | 1856. | 1857. | 1858. | 1859. | 1860. | 1861. | 1862. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total number of prisoners admitted . . | 3,565 | 3,266 | 3,313 | 3,331 | 3,207 | 5,322 | 6,376 | 5,572 | 6,488 | 6,348 | 6,719 | 6,124 | 5,341 |
| „ treated for sickness | 1,113 | 1,035 | 964 | 801 | 815 | 857 | 1,216 | 1,072 | 1,109 | 994 | 1,058 | 863 | 771 |
| Number of sick per cent. to the number of prisoners admitted . | 31·2 | 31·6 | 29·0 | 24·0 | 24·6 | 16·1 | 19·07 | 19·3 | 17·9 | 15·7 | 15·8 | 14·1 | 14·5 |

*Punishments in the Army.*

The measures for the improvement of the condition of the soldier which have been and still are in progress, and the discharge of many of the worst characters from the army, must be allowed their due weight in judging of the present state of discipline by the amount of punishment.

But a comparison of the number of sentences, previous to the establishment of Military Prisons, and at the present time, affords a very favourable indication of the change that has taken place.

In 1843 the number of soldiers imprisoned at any one time under sentence by Court-martial, in Civil Prisons, exclusive of those who might be in confinement by order of Commanding Officers, was in the ratio of 20 in 1,000, and at the same time the number of corporal punishments amounted to annually about 5·2, making 25·2 per 1,000.

In the three years from 1851 to 1854 the number of imprisonments was reduced to 11 per 1,000, and in the four years from 1850 to 1854 the average number of corporal punishments had been reduced to 2·5 per 1,000, being a little more than one half in both cases, and making a total of 13·5 as compared with 25·2.

During the year 1862 it will be found, by referring to the Tables, page 10, that the average number undergoing imprisonment at any one time in the Military Prisons and Barrack Cells amounted to 13·7, and the total corporal punishments in these years amounted to 1·8, making a total of 15·5 per 1,000 as compared with 25·2 in 1843.

---

The recent and sudden death of Major General Sir J. Jebb., K.C.B., Inspector General of Military prisons, causes this report for 1862, prepared by Mr. Fitz Patrick of my subdivision, to be

less copious than the reports of former years, but it is complete in all the statistics which exhibit the effects of the system in operation for the punishment and reformation of military criminals.

I have the honour to be,
My Lord,
Your most obedient humble servant,
G. V. R. DUNBAR.

LONDON:
Printed by George E. Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

# REPORT

ON THE

# DISCIPLINE AND MANAGEMENT

OF THE

# MILITARY PRISONS,

1862.

By GEORGE V. R. DUNBAR, Esq.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1863.

# THIRD REPORT

OF THE

# ROYAL COMMISSIONERS

OF THE

# PATRIOTIC FUND

TO

## HER MAJESTY THE QUEEN.

War Office,
29 May 1863.

HARTINGTON.

*(PRESENTED TO PARLIAMENT BY HER MAJESTY'S COMMAND.)*

*Ordered, by* The House of Commons, *to be Printed,*
2 *June* 1863.

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# THIRD REPORT

OF THE

# ROYAL COMMISSIONERS OF THE PATRIOTIC FUND

TO

# HER MAJESTY THE QUEEN.

---

We, Your Majesty's Commissioners for the administration of the Patriotic Fund for the relief of widows and orphans of soldiers, sailors, and marines, who lost their lives in the late war with Russia, have the honour humbly to present to Your Majesty our Third Report.

2. Your Commissioners, before proceeding to the details of the Fund, must take this opportunity of humbly expressing their deep sorrow at the loss sustained by Your Majesty, and the whole nation, by the death of that illustrious Prince who presided over this Commission with so much ability, and devoted to its business so much care and attention.

Amount of contributions.

3. In our Second Report to Your Majesty, on 9th February 1858, we stated that 1,453,045*l.* had been contributed to the Patriotic Fund; since then the sum of 6,642*l.* has been received, making the total amount of contributions on 31st December 1861, 1,459,687*l.*

Appendices Nos. 1, 2, and 3.

4. A statement of the receipts in each half-year since our former Report, and an account of the investments, together with a statement of the expenditure, will be found in the Appendix to this Report.

Boys' school.

5. The sum set apart to accumulate, for the purpose of establishing a school for boys, now amounts to 32,000*l.*

Nominations to Naval School at New Cross.

6. Your Commissioners have appropriated the sum of 8,000*l.* for the purchase of seven nominations in the Royal Naval School at New Cross, for the sons of officers in Your Majesty's Navy.

New members of Committee.

7. Vacancies having occurred in the Executive and Finance Committee by the death of Major A. J. Little, R.M., and the resignation of G. C. Glyn, Esq., M.P., and W. G. Anderson, Esq., the following gentlemen have been appointed to fill their places, viz.:—

Major-General A. J. Lawrence, C.B.;
Captain J. W. Tarleton, R.N., C.B., and
Rev. G. R. Gleig, Chaplain-General to the Army.

The Rev. J. Woolley, LL.D., one of Your Majesty's Inspectors of Schools, has also been added to the Committee.

Assets and liabilities.

8. An estimate of the probable assets and liabilities of the Fund will be found in the Appendix (No. 4).

Number of widows and orphans relieved.

9. The total number of widows of non-commissioned and petty officers, privates, and seamen, placed on the lists for relief is 3,455, and of children, 4,513, (including 172 who have lost both parents), being an addition of 299 widows, and 507 children, since the date of last Report.

Deaths.

173 widows and 419 children have died since the commencement of the administration of relief, of whom 129 widows, and 224 children have died since the date of last Report.

Number of children provided for.

10. Allowances to children have been discontinued under the following circumstances:—

| | |
|---|---|
| Apprenticed to trades | 139 |
| Entered service | 110 |
| „ army | 11 |
| „ navy | 38 |
| Pupil-teachers | 11 |
| Government schools | 90 |
| Above age | 210 |
| Total | 609 |

Number of re-marriages.

1,302 widows have re-married. Some of these have lost their second husbands, and have returned to their position on the fund.

Officers' widows and children.

11. There are 130 officers' widows, and 225 officers' children in receipt of allowances according to the scale sanctioned by the Royal Commissioners (30th April 1856). Additional allowances are given for the education of 30 of these children, and there are also 21 in the following institutions:—

5 Royal Naval Female School.
6 New Cross.
10 Wellington College.

21

Lord Northwick's offer of house for school.

12. Lord Northwick generously offered to place Thirlestane House at Cheltenham at the disposal of Your Commissioners for the purpose of establishing a boys' school, but finding that a considerable sum would be necessary to make the house suitable, and that no longer term than seven years could be obtained from the ground landlord, Your Commissioners were reluctantly compelled to decline Lord Northwick's offer.

Temporary boys' school.

13. The Executive and Finance Committee have, however, availed themselves of our sanction to form a temporary boys' school, and have taken a house at Wandsworth for that purpose, on a lease of ten years, where are at present 146 boys.

Bequest of Don F. Rodriguez, native of Manilla.

14. Don Francisco Rodriguez, a native of Manilla, who died on the 30th April 1857, having bequeathed the whole of his property, amounting to between 800*l.* and 900*l.* a year, to be applied to the relief of "the families of English subjects wounded or dying "in the wars," and having named as his executors Your Majesty's Consul, and certain English residents of Manilla, the matter was reported by the Consul to the Government. A reference was made by Your Majesty's Government to ascertain if the administration of this property could be undertaken at the Office of the Patriotic Fund.

The subject having been communicated to His Royal Highness the Prince Consort, he desired that a reply should be made to the effect, that the Royal Commissioners, anxious to acknowledge the compliment paid to the nation by the deceased, would gladly undertake the distribution of the property, and that for this purpose a separate account should be kept, to be called the "Rodriguez Fund Account." Owing to disputes on the part of some of the relatives of the deceased, no money has yet been transferred to Your Majesty's Commissioners; but all litigation has recently been set at rest by a decree of the Supreme Court at Madrid, that the will of Don Francisco Rodriguez is perfectly valid.

Royal Victoria Patriotic Asylum.

15. The Royal Victoria Patriotic Asylum, of which Your Majesty was pleased to lay the first stone on the 11th July 1857, was opened for the reception of the orphan girls of the fund on the 1st July 1859, when 150 were admitted: the number has gradually increased to 268, and as soon as the Infirmary is finished, the full number of 300 will be completed.

See Appendix No. 5.

16. In the month of January last one of the inmates of this asylum was unfortunately burned to death while in solitary confinement. An inquest was held, and a verdict of "accidental death" was returned; but the Executive Committee, after a careful investigation of the circumstances, having decided that two of the schoolmistresses—the one in charge of the Asylum during the temporary absence of the Lady Superintendent, the other, to whom the first alarm was communicated—had been culpably remiss in disregarding the information they received, dismissed them both.

17. To provide in future for the better supervision of the domestic arrangements of the establishment, a Committee of thirteen ladies was formed to visit the Asylum monthly, and to report their recommendations to the Executive Committee.

The Ladies' Committee held two meetings at the Asylum, and subsequently reported defects in the management of the Institution, which led them to consider it indispensable that the Lady Superintendent and the Chaplain should be removed.

18. The Executive Committee investigated the matters so reported to them, and the general condition of the Asylum, and came to the following resolution:—

Resolved,—"That the Committee, having carefully considered the communications "and evidence which have been submitted to them with respect to the management "of the Royal Victoria Patriotic Asylum, and certain punishments which have been "inflicted, disapprove and regret the conduct of the Lady Superintendent and the "Chaplain in some instances. But considering the peculiar circumstances under "which the schools have been carried on in the absence of regular supervision, "excepting that of the Senior Honorary Secretary of the Royal Commission, the "Committee are of opinion that a recurrence of these faults may be prevented by

" improved regulations and proper inspection, and that therefore it is not necessary to
" proceed to the extreme measure of now calling upon either the Lady Superintendent
" or Chaplain to resign their situations."

The Committee have, accordingly, prepared and laid before us an amended code of rules for the future government of the Institution.

19. After perusing the documents which had been submitted to us, and hearing the further explanations of the Chairman of the Executive Committee, a majority of the Royal Commissioners, present at the meeting when the subject was discussed, approved of the decision at which the Committee had arrived.

20. We regret to have to inform Your Majesty that four of the ladies were so strongly convinced that a change in the persons intrusted with the management of the Institution was absolutely necessary for the welfare of its inmates, that they thought it their duty to decline serving any longer on the Visiting Committee, when they learned that the Executive Committee had come to the conclusion that no such change should be made. Three more of the ladies took the same view of the necessity of the measure they had recommended, but suspended their resignation until it should be ascertained whether we should confirm the decision of the Executive Committee. On being informed that we had done so, they have also signified to us that they can no longer act as members of the Visiting Committee of Ladies, so that we have lost the services of a majority of those originally appointed.

We think it right to lay before Your Majesty, in the Appendix to this Report, the correspondence which has led to this unfortunate result. Appendix 6.

21. We have the honour to inform Your Majesty that the Bishops of London and Winchester have been requested by us to visit the Institution at their convenience, from time to time, and to report anything that may come under their observation to the Executive and Finance Committee, and that these Prelates have signified their willingness so to act.

22. We insert in the Appendix the Report of the Rev. F. C. Cook, one of Your Majesty's Inspectors of Schools; and we hope that, with the revised rules carried out under regular and periodical inspection, the condition of the Asylum will be hereafter in every respect satisfactory, and give full effect to the benevolent purposes for which Your Majesty has honoured it with Your Royal patronage and support. Appendix 7.

| | |
|---|---|
| NEWCASTLE. | ST. LEONARDS. |
| WELLINGTON. | FERMOY. |
| DERBY. | LYVEDEN. |
| DALHOUSIE. | J. L. LINDSAY. |
| SHAFTESBURY. | H. CORRY. |
| HARDWICKE. | EDWARD ELLICE. |
| CHICHESTER. | JOHN S. PAKINGTON. |
| NELSON. | W. PARKER. |
| GREY. | J. F. BURGOYNE. |
| COMBERMERE. | H. D. ROSS. |
| ROKEBY. | THOMAS BARING. |
| COLCHESTER. | J. WILSON PATTEN. |
| SEATON. | JOHN BALL. |

28*th July* 1862.

# APPENDIX.

## APPENDIX I.

STATEMENT showing the AMOUNT of CONTRIBUTIONS received during each HALF-YEAR of 1858, 1859, 1860, and 1861.

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| To 31st December 1857, as mentioned in Second Report | | | | 1,453,045 | 3 | 1 |
| 30th June 1858 | 2,223 | 2 | 11 | | | |
| 31st December 1858 | 511 | 2 | 6 | | | |
| 30th June 1859 | 1,136 | 3 | 8 | | | |
| 31st December 1859 | 1,817 | 5 | 3 | | | |
| 30th June 1860 | 52 | 7 | 1 | | | |
| 31st December 1860 | 899 | 10 | 6 | | | |
| 30th June 1861 | 1 | 1 | 0 | | | |
| 31st December 1861 | 1 | 8 | 0 | | | |
| | | | | 6,642 | 0 | 11 |
| Total | | | | £1,459,687 | 4 | 0 |

## APPENDIX II.

STATEMENT of INVESTMENTS on 31st December 1861.

| | £ | s. | d. | Cost, with Interest due at time of Purchase. £ | s. | d. |
|---|---|---|---|---|---|---|
| Imperial Turkish 4 per cent. Debentures | 120,200 | 0 | 0 | 122,155 | 5 | 0 |
| Canada Government 4 per cent. Debentures | 17,000 | 0 | 0 | 17,276 | 5 | 0 |
| Peninsular and Oriental Steam Navigation Company's Debentures | 10,000 | 0 | 0 | 10,025 | 0 | 0 |
| East India Government 4 per cent. Debentures Loan | 105,000 | 0 | 0 | 99,776 | 16 | 5 |
| East India Railway Stock | 65,580 | 0 | 0 | 70,963 | 10 | 0 |
| Ditto ditto Extension Shares | 6,560 | 0 | 0 | 6,560 | 0 | 0 |
| London and North-western Railway Debenture | 80,000 | 0 | 0 | 80,000 | 0 | 0 |
| Great Western | 80,000 | 0 | 0 | 80,000 | 0 | 0 |
| North-eastern | 60,000 | 0 | 0 | 60,025 | 0 | 0 |
| Grand Southern and Western Railway (Ireland) | 25,000 | 0 | 0 | 25,000 | 0 | 0 |
| | £569,340 | 0 | 0 | £571,781 | 16 | 5 |

*Terminable Annuities.*

| £ | | | £ | s. | d. | | | |
|---|---|---|---|---|---|---|---|---|
| 11,800 | expiring | 5th July 1865 | 99,912 | 10 | 10 | | | |
| 5,817 | „ | 5th Jan. 1866 | 49,997 | 14 | 11 | | | |
| 2,033 | „ | 10th Oct. 1867 | 19,991 | 2 | 6 | | | |
| 1,289 | „ | 5th Jan. 1871 | 14,993 | 1 | 0 | | | |
| 4,787 | „ | 10th Oct. 1870 | 55,971 | 10 | 3 | | | |
| 3,405 | „ | 5th Jan. 1876 | 49,993 | 19 | 2 | | | |
| 6,097 | „ | 5th Apr. 1876 | 89,993 | 2 | 3 | | | |
| 16,900 | „ | 5th July 1885 | 287,218 | 16 | 7 | | | |
| | | | | | | 668,071 | 17 | 6 |
| | | Total | | | | £1,239,853 | 13 | 11 |

SECURITIES of ROYAL VICTORIA PATRIOTIC ASYLUM.

| | £ | s. | d. | Cost. £ | s. | d. |
|---|---|---|---|---|---|---|
| London and Greenwich Railway Company Debentures | 50,000 | 0 | 0 | 50,062 | 10 | 0 |
| Victoria Government 6 per cent. Debentures | 20,000 | 0 | 0 | 22,087 | 10 | 0 |
| South Australian Government 6 per cent. Debentures | 10,000 | 0 | 0 | 10,300 | 0 | 0 |
| New South Wales Government 5 per cent. Debentures | 20,000 | 0 | 0 | 19,887 | 10 | 0 |
| Canada Government 6 per cent. Debentures | 30,000 | 0 | 0 | 32,750 | 0 | 0 |
| New Brunswick Government 6 per cent. Debentures | 5,000 | 0 | 0 | 5,012 | 10 | 0 |
| | £135,000 | 0 | 0 | £140,100 | 0 | 0 |

SECURITIES of BOYS' SCHOOL ACCOUNT.

| | £ | s. | d. | Cost. £ | s. | d. |
|---|---|---|---|---|---|---|
| East India 4 per cent. Debenture Loan | 30,000 | 0 | 0 | 28,517 | 9 | 4 |

# APPENDIX III.

## STATEMENT of RECEIPTS and EXPENDITURE of PATRIOTIC FUND to 31st December 1861.

### RECEIPTS.

| | £ | s. | d. |
|---|---|---|---|
| To amount of contributions received | 1,459,687 | 4 | 0 |
| „ received as annuities and interest on securities purchased and profits on changes of investments | 516,295 | 2 | 4 |
| „ received from Amateur Artists' Fund (Burlington House) for widows and orphans of officers | 4,607 | 2 | 2 |
| | £1,980,589 | 8 | 6 |

### EXPENDITURE.

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| By amount paid as allowances to widows and orphans | 382,481 | 5 | 7 | | | |
| „ as per-centage on payments to staff officers and others | 7,095 | 16 | 4 | | | |
| „ for purchase of nominations to— | | | | | | |
| „ Wellington College £25,000 | | | | | | |
| „ Royal Naval School at New Cross 8,000 | | | | | | |
| „ Royal Naval Female School 5,000 | | | | | | |
| „ Cambridge Asylum 3,000 | | | | | | |
| „ Naval and Military Schools at Portsmouth and Plymouth, 2,500*l.* each 5,000 | | | | | | |
| | 46,000 | 0 | 0 | | | |
| „ as allowances to widows and orphans of officers | 46,050 | 9 | 10 | | | |
| | | | | 481,627 | 11 | 9 |
| „ to widows and orphans of officers from Amateur Artists' Fund (Burlington House) | | | | 4,590 | 0 | 0 |
| „ for advertisements | | | | 1,853 | 0 | 3 |
| „ to Senior Honorary Secretary, per resolutions of Royal Commissioners | 2,235 | 3 | 8 | | | |
| „ as salaries | 9,108 | 2 | 4 | | | |
| | | | | 11,343 | 6 | 0 |
| „ for stationery and printing | 1,614 | 14 | 10 | | | |
| „ postage | 457 | 0 | 1 | | | |
| „ fuel and lighting | 70 | 12 | 7 | | | |
| „ travelling expenses | 300 | 11 | 3 | | | |
| „ miscellaneous | 362 | 12 | 1 | | | |
| „ foreign bill stamps | 109 | 15 | 4 | | | |
| | | | | 2,915 | 6 | 2 |
| | | | | 502,329 | 4 | 2 |
| By balance:— | | | | | | |
| Cost of securities (Appendix II.) | 1,239,853 | 13 | 11 | | | |
| Cash at Bank of England | 5,562 | 13 | 7 | | | |
| „ in the office | 23 | 18 | 11 | | | |
| „ at the War Office, and in the hands of local authorities for payment of allowances | 1,029 | 1 | 0 | | | |
| | | | | 1,246,469 | 7 | 5 |
| By amount carried to separate account of Royal Victoria Patriotic Asylum on 30th June 1860, viz.:— | | | | | | |
| Securities of endowment | 140,100 | 0 | 0 | | | |
| Sums granted for purchase of land, building, &c. &c. | 63,173 | 7 | 7 | | | |
| | | | | 203,273 | 7 | 7 |
| Cost of securities set aside for boys' school, together with interest due at time of transfer to separate account on 30th June 1860 | | | | 28,517 | 9 | 4 |
| | | | | £1,980,589 | 8 | 6 |

# APPENDIX IV.

## AMENDED ESTIMATE of CHARGE and INCOME.

*Charge.*

| | | | | |
|---|---|---|---|---|
| Temporary charge for 1,914 widows at 14*l.* each per annum | | | £26,796 | |
| Abate for remarriage 5 per cent. | | | 1,340 | |
| | | | £25,456 | |
| Temporary charge for 1,132 remarried at 7*l.* each per annum | | £7,924 | | |
| Add moiety of rebate above deducted, viz. | | 670 | | |
| | | | 8,594 | |
| In respect of 3,046 widows | | | £34,050 | |
| Temporary charge for 129 widows of officers at 38*l.* each per annum | | | 4,902 | |
| Annual charge for 3,175 widows | | | | £38,952 |
| Temporary charge for 2,632 children at £4 10*s.* each per annum | | | £11,844 | |
| Ditto ditto 1,100 ditto 16 0*s.* ditto ditto | | | 17,600 | |
| Ditto ditto 237 ditto 15 0*s.* ditto ditto | | | 3,555 | |
| Annual charge for 3,969 children | | | | 32,999 |
| Widows and children | | | | £71,951 |
| Temporary annual charge for extras, &c. | | | £1,000 | |
| For management (rising to 2,560*l.*) | | | 2,200 | |
| | | | | 3,200 |
| Total charge | | | | £75,151 |

*Income.*

| | | |
|---|---|---|
| Perpetuities. | Turkish Government guaranteed debentures | £4,844 |
| | Canada Government ditto ditto | 680 |
| | East India debenture loan | 4,200 |
| | East India railway stock guaranteed | 3,607 |
| | London and North-western railway debentures | 3,200 |
| | Great Western ditto ditto | 3,200 |
| | Great Southern and Western ditto ditto | 1,000 |
| | North-eastern ditto ditto | 1,600 |
| | North-eastern ditto stock | 800 |
| | Peninsular and Oriental Steam Navigation Company debentures | 400 |
| | Perpetuities | £23,531 |
| Terminable. | Annuities, certain, expiring at various dates £52,128 | |
| | Other terminable dividends ditto 1,112 | |
| | Terminable | 53,240 |
| | Total income | £76,771 |

ALEXANDER GLEN FINLAISON,
March 13th, 1861.

## Appendix IV.—*cont.*

Statement for each Year from and after 1860, to the Year 1900, of the probable Temporary and Permanent Charge on the Patriotic Fund; also the Terminable and Perpetual Income available to meet the said Demands; and further, the Deficiency or Surplus of Income in each Year, as the Case may be.

| Year. | Charge. | | | | | Income. | | | Deficiency. | Surplus. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Temporary. | | | Chiefly Permanent as per Memoranda. | Temporary and Permanent. | Terminable. | Perpetual. | Terminable and Perpetual. | | |
| | For Widows. | For Children. | Widows and Children. | | | | | | | |
| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ |
| 1861 | 38,952 | 32,999 | 71,951 | 3,200 | 75,151 | 53,240 | 23,531 | 76,771 | | 1,620 |
| 1862 | 38,517 | 32,753 | 71,270 | 3,260 | 74,530 | 53,240 | 23,531 | 76,771 | | 2,241 |
| 1863 | 38,081 | 32,532 | 70,613 | 3,320 | 73,933 | 52,878 | 23,531 | 76,409 | | 3,476 |
| 1864 | 37,642 | 32,334 | 69,976 | 3,380 | 73,356 | 52,578 | 23,531 | 76,109 | | 2,753 |
| 1865 | 37,200 | 32,151 | 69,351 | 3,440 | 72,791 | 52,353 | 23,531 | 75,884 | | 3,093 |
| 1866 | 36,735 | 31,974 | 68,709 | 3,500 | 72,209 | 37,419 | 23,531 | 60,950 | 11,259 | |
| 1867 | 36,417 | 31,796 | 68,213 | 3,560 | 71,773 | 34,511 | 23,531 | 58,042 | 13,731 | |
| 1868 | 35,952 | 31,606 | 67,558 | 3,560 | 71,118 | 32,478 | 23,531 | 56,009 | 15,109 | |
| 1869 | 35,484 | 31,397 | 66,881 | 3,560 | 70,441 | 32,478 | 23,531 | 56,009 | 14,432 | |
| 1870 | 35,012 | 3,347 | 38,359 | 3,560 | 41,919 | 32,478 | 23,531 | 56,009 | | 14,090 |
| 1871 | 34,537 | 3,312 | 37,849 | 2,560 | 40,409 | 27,047 | 23,531 | 50,578 | | 10,169 |
| 1872 | 34,174 | 3,273 | 37,447 | 2,560 | 40,007 | 26,402 | 23,531 | 49,933 | | 9,926 |
| 1873 | 33,688 | | 33,688 | 2,560 | 36,248 | 26,402 | 23,531 | 49,933 | | 13,685 |
| 1874 | 33,197 | | 33,197 | 2,560 | 35,757 | 26,402 | 23,531 | 49,933 | | 14,176 |
| 1875 | 32,701 | | 32,701 | 2,560 | 35,261 | 26,402 | 23,531 | 49,933 | | 14,672 |
| 1876 | 32,200 | | 32,200 | 2,560 | 34,760 | 21,652 | 23,531 | 45,183 | | 10,423 |
| 1877 | 31,795 | | 31,795 | 2,560 | 34,355 | 16,900 | 23,531 | 40,431 | | 6,076 |
| 1878 | 31,258 | | 31,258 | 2,560 | 33,818 | 16,900 | 23,531 | 40,431 | | 6,613 |
| 1879 | 30,699 | | 30,699 | 2,560 | 33,259 | 16,900 | 23,531 | 40,431 | | 7,172 |
| 1880 | 30,120 | | 30,120 | 2,560 | 32,680 | 16,900 | 23,531 | 40,431 | | 7,751 |
| 1881 | 29,520 | | 29,520 | 2,560 | 32,080 | 16,900 | 23,531 | 40,431 | | 8,351 |
| 1882 | 28,997 | | 28,997 | 2,560 | 31,557 | 16,900 | 23,531 | 40,431 | | 8,874 |
| 1883 | 28,350 | | 28,350 | 2,560 | 30,910 | 16,900 | 23,531 | 40,431 | | 9,521 |
| 1884 | 27,679 | | 27,679 | 2,560 | 30,239 | 16,900 | 23,531 | 40,431 | | 10,192 |
| 1885 | 26,982 | | 26,982 | 2,560 | 29,542 | 16,900 | 23,531 | 40,431 | | 10,889 |
| 1886 | 26,258 | | 26,258 | 2,560 | 28,818 | | 23,531 | 23,531 | 5,287 | |
| 1887 | 25,590 | | 25,590 | 2,560 | 28,150 | | 23,531 | 23,531 | 4,619 | |
| 1888 | 24,804 | | 24,804 | 2,560 | 27,364 | | 23,531 | 23,531 | 3,833 | |
| 1889 | 23,984 | | 23,984 | 2,560 | 26,544 | | 23,531 | 23,531 | 3,013 | |
| 1890 | 23,134 | | 23,134 | 2,560 | 25,694 | | 23,531 | 23,531 | 2,163 | |
| 1891 | 21,916 | | 21,916 | 2,560 | 24,476 | | 23,531 | 23,531 | 945 | |
| 1892 | 21,236 | | 21,236 | 2,560 | 23,796 | | 23,531 | 23,531 | 265 | |
| 1893 | 20,207 | | 20,207 | 2,560 | 22,767 | | 23,531 | 23,531 | | 764 |
| 1894 | 19,143 | | 19,143 | 2,560 | 21,703 | | 23,531 | 23,531 | | 1,828 |
| 1895 | 18,051 | | 18,051 | 2,560 | 20,611 | | 23,531 | 23,531 | | 2,920 |
| 1896 | 16,951 | | 16,951 | 2,560 | 19,511 | | 23,531 | 23,531 | | 4,020 |
| 1897 | 15,852 | | 15,852 | 2,560 | 18,412 | | 23,531 | 23,531 | | 5,119 |
| 1898 | 14,750 | | 14,750 | 2,560 | 17,310 | | 23,531 | 23,531 | | 6,221 |
| 1899 | 13,645 | | 13,645 | 2,560 | 16,205 | | 23,531 | 23,531 | | 7,326 |
| 1900 | 12,540 | | 12,540 | 2,560 | 15,100 | | 23,531 | 23,531 | | 8,431 |

## APPENDIX V.

*Surrey* } INFORMATIONS of Witnesses taken on Oath at
*to wit.* } the ROYAL VICTORIA PATRIOTIC ASYLUM, in the Parish of Wandsworth, in the County of Surrey, the Tenth day of January 1862, before me, WILLIAM CARTER, one of Her Majesty's Coroners for the said County, on view of the Body of CHARLOTTE JANE BENNETT, then and there lying dead.

ELIZABETH M'DONNELL sworn, saith—I am a single woman, I am a servant here as head housemaid; the person dead I knew; her name Charlotte Jane Bennett, aged 17 years last birthday; she was a servant, but not receiving wages. On the evening of Tuesday last, the 7th instant, at about 25 minutes past 8 o'clock, I took some tea to a room in this establishment for her. I had had a knowledge she had been in that room from 9 o'clock a.m. (for punishment, having been insolent to the laundry-woman); that under the chaplain's direction. I having a key proceeded to open the door; yet when at the door I smelt a smell of burning. I did not see any fire or hear any noise. On opening the door I found the gas was alight, and I saw her, deceased, lying on the boarded floor on her back, and in a state of nudity, by reason of her clothes having taken fire. A small portion of her chemise only on her body, except her boots and part of her stockings. She appeared dead; nothing was found covering her. I went for Mr. Kirkby, the chaplain; I had seen her at ½ past 4 o'clock that afternoon; she was then in good health; she was alone. I had retained the key all day, so that no one could get access to her. I had not lit the gas; it was not burning when I last saw her alive. The room is called the bath-room, therein being a fixed bath, with taps to supply it with water, hot and cold. There was no water in the bath. She was greatly burnt on her body, arms, legs, and face. I knew there were lucifer matches on the mantelshelf, also a fire in the room composed of coal. There were newspapers in the room, and therefore had the means of lighting the gas. The gas burner projects from the wall, the supplying pipe being in the wall; that burner just at the side of the window of the room. She was lying extended from the window towards the door, her feet being next or under the window. There was a chair by her side, on its side. The burner was about seven feet from the floor. Her stature was about five feet. She could not have lighted the gas without the use of the chair, or standing on something. There was a blind to the window, which had been consumed by fire, the roller remaining up as fixed. She was there all the day of Monday, from 11 o'clock a.m. to 10 o'clock at night. Then she went to her bedroom, and at nine o'clock the next morning went of her own accord thereto, as desired by the chaplain. I had supplied her with her meals; she was not supplied with needlework, but had a book. She, however, appeared quite calm in mind and quite happy. She did on the Tuesday afternoon say she should be glad when the chaplain came to let her out, as she was tired of stopping, and was sorry for her misconduct. I feel confident she has not done any act to cause her own death. The cause of the fire, in my opinion, arose, that she got on a box that contained papers, which was immediately under the gas-light to light the gas, using a match or paper: the window blind ignited, being of cotton material, and in her trying to extinguish it her clothing caught. The bath-room is on the second floor in front; the room over is a work-room, and persons were therein from half-past six o'clock, not after, as the needlewoman was out. There was a small portion of fire near her, arising from the remains of her clothing. I conceive she would have lighted the gas at five o'clock. She did partake of her dinner; it was the first occasion after being locked up. The punishment was quite necessary.

WILLIAM KIRKBY sworn, saith—I am a clerk in holy orders, and chaplain to this establishment. The deceased person I knew as being here as an orphan, and to be instructed in household duties. On last Tuesday evening the last witness came to me, and upon her information I accompanied her to the bath room. I there saw the deceased lying on the floor as described. I have no doubt she must have lost her life from injuries by fire. I noticed the window blind was wanting, as having been consumed by fire. I noticed the window, the chair spoken of, and noticed one of her knees through the bars of the chair; the bottom of the chair was burnt out, and the back of it also. I did find the remains of a lucifer match under the gas burner. The blind was linen, and on a spring roller. I have noticed charred remains of the blind on the roller; so that my belief is, that in lighting the gas with a match she let it drop, and in getting off the box her clothes ignited; that she had ran to the door—as there were marks on the floor, with slight scorching of the paper—then had returned to the window for air, the flames arising from her clothes igniting the blind, and then fell from suffocation and died. I had placed her in the bath room, as having witnessed some insubordination on her part on the day of Monday, as a punishment by separation, as necessary for the well being of the establishment; but I did not see her after that time alive, yet knew of her by report. The smoke had cleared away, so that the fire had ceased some time to her death being discovered. I have known her for six months. I feel satisfied it was the result of accident.

SARAH REARDON, sworn, saith—I am sixteen years of age, and am now a servant here, having been a pupil. I knew the deceased person. I had been for a holiday from Monday last to the following day evening, returning at a little before five o'clock. I understood the deceased was locked up in the superintendent's bath room. At about six o'clock I was in a room immediately under that bath room, and I then heard a screaming and a knocking over head. A girl named Walters came in and said, I wonder what that girl is doing walking up and down now. I went outside and went with Jane Duncan half way up stairs. At the moment one of the teachers passed across the hall and called to Duncan, who went away, and I returned to the portress's room, yet I did not make known to any one what I had heard.

Verdict of *Accidental death.*

## APPENDIX VI.

[*Private and Confidential, for the Information of the Royal Commissioners.*]

From MINUTES of EXECUTIVE and FINANCE COMMITTEE.

25th January 1862.

RESOLVED:—That there shall be a Visiting Committee of Ladies.*

The duties of the Ladies' Committee will be—

To exercise a supervision of the domestic arrangements of the Institution, as relating to the care of the children of all ages, in health and sickness; their diet, dress, occupations out of school hours, and their training for domestic service or industrial employments.

The Ladies' Committee will please to embody their recommendations in writing, and communicate them to the Chairman of the Executive and Finance Committee for consideration.

The ladies will meet as a committee, by summons, on the second Tuesday of each month, and on such other occasions as they may think fit. Three ladies will form a quorum.

They will keep a minute book, and enter all their observations and recommendations in writing.

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* Adair, Mrs.
Brown, Mrs.
Colchester, The Lady.
Cook, Mrs.
Coutts, Miss Burdett.
Fishbourne, Mrs.
Kirkby, Mrs.
Lefroy, Mrs.
Lindsay, Lady Sarah.
Morrison, Mrs. Frank.
Prescott, Mrs. Wm.
Sugden, The Hon. Miss.
Wellesley, The Hon. Mrs.

| Meeting of Ladies' Committee, 11th Feb. 1862. | Decisions of Executive and Finance Committee thereon, as communicated to the Ladies by Letter of 8th March 1862. |
|---|---|
| It was resolved:— | |
| 1. That separation from their companions at meals, during exercise, and at other times, be generally adopted as a mode of punishment. | It is already in practice. |
| 2. That any girl whose conduct shall have been refractory, or otherwise unmanageable, shall be brought before the Ladies' Committee at their next Monthly Meeting. | In any such case the girl is to be brought before the Ladies' Committee, and the ladies are requested to take notice of such continued refractory conduct made known to them by the Lady Superintendent; and if necessary to report thereon to the Executive Committee. |
| 3. That the Senior Mistress of the Senior School be appointed to take charge of Miss Clavell's duties, during any temporary absence,—to whom alone she should delegate her authority. Miss Clavell and this Mistress should not be allowed to absent themselves at the same time. | In the absence of Miss Clavell, the Senior Mistress present in the Establishment is to take charge of her duties. |
| 4. That girls be allowed to appeal to Mrs. Kirkby, in the event of their feeling aggrieved, or of their desiring further advice than that which they could otherwise obtain. | The Executive Committee conceive the object the Ladies' Committee had in view will be obtained by the alteration which they have authorized in Byelaw No. 16, which is as follows:—<br>"That the mistresses are to endeavour to obtain the confidence of the children placed under them, and to encourage them to state any difficulty they experience, or anything for which they may think they have a ground of complaint, and the children shall be allowed to appeal to the Lady Superintendent, in the event of their feeling aggrieved, or of their desiring further advice than they could otherwise obtain."<br>Adopted. |
| 5. Any complaint made by mothers respecting their children should be laid before the Ladies' Committee, at their next Monthly Meeting. | |

From Minutes of Ladies' Committee.

11th March 1862.

Read a letter from Lord Colchester, Chairman of the Executive and Finance Committee, enclosing the decisions of that Committee upon the suggestions of the Ladies' Committee, and the regulations to be observed when necessary to place a girl in solitary confinement.

The suggestions of last Meeting having been again read over, it was

Resolved,—That the first suggestion, as recorded, did not adequately represent the views of the Ladies' Committee with respect to punishment by solitary confinement; as the ladies were then of opinion that solitary confinement ought not to be resorted to as a mode of punishment.

The above Resolution was carried by the votes of six ladies, three being of opinion that solitary confinement might be resorted to under certain restrictions.

With reference to the decision on suggestion 3 of last Meeting, it was

Resolved unanimously, — That the ladies are still of opinion that, in the absence of the Lady Superintendent, her duties ought only to devolve upon the Senior Mistress of the Senior School; and that the Lady Superintendent and that Mistress ought not to be absent at the same time.

Miss Clavell, the Lady Superintendent, having been called in, and requested to state if there was anything she wished to bring under the notice of the Ladies' Committee, stated that several cases of petty theft had recently taken place, but she had failed in discovering any trace of the culprit. She further stated that such things had taken place for a long time past. It was thereupon

Resolved unanimously,—That the subject ought to be represented to the Executive Committee, for them to take such steps as they may consider necessary to prevent the recurrence of such practices, and to request the gentlemen to be pleased to acquaint the ladies of the result of their endeavours.

The Ladies' Committee examined ten girls in reference to the above subject.

It having come to the notice of the Ladies' Committee, in the course of the inquiry into the petty thefts, that the Laundress has been allowed to take certain girls out of the Institution for a walk, when they have opportunities of spending money, and of bringing sweetmeats and other things into the Asylum—they beg to record their opinion that such a practice is open to grave objection, and ought not to be permitted in future.

The Rev. Mr. Kirkby was requested to give the ladies information on one or two matters, and a conversation took place with him on the subject of the thefts; and he was requested by the Ladies' Committee to write at once to Sir Richard Mayne to obtain the services of a detective in the hope of tracing the culprit or culprits.

A case having been mentioned of a girl (Elizabeth Thompson), who has been in service and returned to the institution, in consequence of dishonesty—

The Ladies' Committee suggest that the return to the Asylum of girls who have not conducted themselves satisfactorily whilst in service is objectionable, and likely to lead to serious consequences by the effect they may have on other girls.

Miss Coutts having requested to see the record of punishments in the institution, Mr. Kirkby produced the small book which he has kept for his own satisfaction; and as it appeared that punishments had taken place, which she had understood were not permitted, it was

Resolved,—That the Ladies' Committee suggest that this book should be called for and examined by the Executive Committee.

From a Portion of the Ladies' Committee.

27th March 1862.

We the undersigned Ladies of the Committee for the supervision of the Victoria Asylum at Wandsworth, being aware that in consequence of circumstances lately brought to light with regard to the internal management of this institution, the Executive Committee intend to hold a Meeting on Friday next, the 28th March, for the purpose of taking into consideration the reorganization of this Establishment, we feel this to be the proper time to lay before the Executive Committee the expression of our opinion, and to state at once the circumstances under which we could not consent to continue the exercise of our functions.

Being convinced that the Institution has been entirely mismanaged, we could not continue to act with the parties to whom the Executive Committee has hitherto intrusted its local management. We could not place confidence in the channel of communication which has hitherto kept the Executive Committee in ignorance of so many important details with regard to its internal administration.

We feel that the Chaplain has assumed powers not authorized by the Executive Committee—that his punishments have been severe and totally unsuitable and revolting, especially in a girls' school.

We feel that the Lady Superintendent is unequal to the control of such an establishment, as not possessing sufficient judgment of her own, and as having consented to follow out unauthorized orders, which she herself felt to be objectionable.

We are of opinion that, in a girls' school, a woman should be the responsible head of the establishment. With regard to corporal punishment, we feel it to be totally inadmissible in a girls' school, and we have ascertained that in the Metropolitan Workhouse and Pauper Schools, an *absolute prohibition* exists against its infliction on any female child.

Such being our opinion, we should feel that too heavy a responsibility would be thrown upon the Ladies' Committee, unless a very different system of management were to be adopted, and that they were to be relieved from the fear that any degree of concealment from the Executive Committee should again occur.

Signed by,

| | |
|---|---|
| Lady Colchester. | Miss Coutts. |
| The Hon. Mrs. Wellesley. | Mrs. Cook. |
| The Hon. Miss Sugden. | Mrs. Brown. |
| Mrs. Adair. | Mrs. Prescott. |

### Reply from the Executive and Finance Committee.

Madam, 28th March 1862.

I this day read to the Executive Committee the letter signed by yourself and other ladies of the Committee, relative to the conduct of the Chaplain and Lady Superintendent of the Victoria Asylum.

The Committee desire to thank the ladies for their opinion expressed on the conduct of the Asylum, but they are unable to receive the letter officially, not being agreed to at a meeting of the Ladies' Committee regularly summoned. They, however, have under their consideration the whole question of the future government of the Asylum, as well as the conduct of the present Chaplain and Lady Superintendent, and when they have arrived at a decision, I shall have the honour to inform you of the result.

I am, &c.

(Signed) Colchester,

Chairman of the Executive and Finance Committee.

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### From Minutes of Meeting of Ladies' Committee.

1st April 1862.

1. Some misapprehension having arisen respecting the meeting of the Ladies' Committee of the 27th ultimo, in consequence of which their letter embodying the results of their investigations at the Royal Victoria Patriotic Asylum could not be officially received, as having been drawn up at a meeting not regularly summoned, the monthly meeting has been called to rectify that informality.

2. The ladies are aware that the Executive Committee have hitherto depended for all local information with regard to the Wandsworth Asylum upon the Honorary Secretary, Captain Fishbourne, selected by them as their channel of communication with the Asylum, whilst they have held their meetings in New Street; where they have lately examined the Chaplain, the Rev. Mr. Kirkby, and the Lady Superintendent, Miss Clavell. When the Ladies' Committee was appointed by the Executive Committee, it became their duty to go down to the Victoria Asylum at Wandsworth, and there to see with their own eyes and hear with their own ears, and to report to the Executive Committee the result of their investigations, and the opinions to which they have been led.

3. The disclosures which took place at their second meeting at Wandsworth on the 11th of March occupied so much of their attention, that the Ladies' Committee had not time to record on the minutes the very grave objections they entertained against the existing system of management at the Asylum, and their unwillingness to act with the present officials.

4. It was on this account that they determined to embody these opinions in the letter signed by eight of the ladies at their meeting on the 27th ult. (*vide* p. 10), to which they now beg, for the above reasons, to draw the attention of the Executive Committee (copy appended to the minutes); for although this letter has been set aside on a point of form, the Ladies' Committee feel they should be extremely negligent of their duty if, by any delay in the rectification of their error, the vital interests of the Royal Victoria Patriotic Asylum should be sacrificed to a technical difficulty. The gentlemen at present possess no other evidence of the opinion of the Ladies' Committee as to their conviction of the utter hopelessness of the success of their best endeavours until a system of moral control shall be established over the children—until the religious instruction which they receive shall no longer be, as at present, apparently unconnected in their minds with their practical duties—and until the whole tone of the establishment shall become more in accordance with the recognised principles of female training.

5. However, from the increased activity of the Executive Committee since they have been made aware of the real condition of the school, the ladies have every reason to flatter themselves that the whole institution will, ere long, be placed on a thoroughly satisfactory footing,—an opinion in which they are confirmed by the intimation which they have received, that the whole constitution of the Asylum, as well as the conduct of the officials, is under full consideration.

6. The ladies conclude that, after the Meeting of the Royal Commissioners, they will receive from the Executive Committee an announcement of the changes and reforms to be made in the Asylum, until which period they deem it advisable to suspend the exercise of their functions.

The foregoing paragraphs were adopted by Lady Colchester, the Hon. Mrs. Wellesley, the Hon. Miss Sugden, Mrs. Adair, Miss Coutts, Mrs. Brown, Mrs. Cook, and Mrs. Prescott. Lady Sarah Lindsay and Mrs. Lefroy, although agreeing on the other points, deferred their assent to the last part of the third paragraph until they knew the result of the further investigations which they believed were in progress by the Executive Committee.

Mrs. Fishbourne dissented, feeling that she could not pass judgment, as she knew so little of the working of the Institution.

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### From Executive Committee to Ladies' Committee.

Madam, 9th May 1862.

I have the honour to inform you, at the request of the Executive Committee of the Royal Patriotic Fund Commission, that, with reference to communications they have received from the Committee of Ladies, they have unanimously adopted the following Resolution:—

"Resolved, — That the Committee, having carefully
" considered the communications and evidence which
" have been submitted to them, with respect to the
" management of the Royal Victoria Patriotic Asylum,
" and certain punishments which have been inflicted,
" disapprove and regret the conduct of the Lady Super-
" intendent and the Chaplain in some instances. But
" considering the peculiar circumstances under which
" the schools have been carried on in the absence of
" regular supervision, excepting that of the Senior
" Honorary Secretary of the Royal Commission, the
" Committee are of opinion that a recurrence of these
" faults may be prevented by improved regulations and
" proper inspection, and that therefore it is not neces-
" sary to proceed to the extreme measure of now calling
" upon either the Lady Superintendent or Chaplain to
" resign their situations."

In arriving at this decision, the Committee show that they are not insensible of the objectionable nature of facts which have been brought to their knowledge by the Committee of Ladies.

The Committee feel under great obligations to the Committee of Ladies for the investigations they have made, and for the information they have given; and they earnestly hope that services so valuable may be hereafter continued. The importance of the assistance and advice of ladies in the conduct of such an institution cannot be estimated too highly.

They also indulge a hope that, on reconsideration, the Committee of Ladies will not dissent from the course which the Committee deem it their duty to take.

While the Committee are compelled to view with regret the particular circumstances referred to, they feel bound to make allowance for the difficulties which are incidental to the commencement of such an establishment, and also for the want of previous experience on the part of both the Lady Superintendent and the Chaplain; and they must also express their belief that, although there may have been want of discretion in some part of the conduct of those officers, they have both of them been sincerely desirous faithfully to perform their duties.

The Committee therefore feel that, under the whole circumstances, they will best consult the permanent interests of the Institution by looking to the future rather than to the past; hoping that with improved Rules, and under more effective superintendence, both Miss Clavell and Mr. Kirkby will be able efficiently to fill their respective offices.

The Committee had hoped to send, together with this letter, a completed revision of the rules and regulations; but finding that more time will be required than had been anticipated, they prefer to forward at once this communication to the Ladies' Committee.

I have, &c.

(Signed) Colchester.

Chairman of the Executive and Finance Committee.

To the Lady presiding at the Committee of Ladies.

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### From Minutes of Ladies Committee.

10th May 1862.

Read letter from Chairman of Executive and Finance Committee, dated 9th instant, enclosing a copy of the resolution of that date respecting the Lady Superintendent and Chaplain.

After consideration, the following letter was signed by a portion of the Ladies' Committee:—

### To the Executive Committee.

10th May 1862.

We, the undersigned Ladies of the Committee, having received your communication of yesterday's date, beg to make the following statement:—

When the fatal event which occurred at the Victoria Asylum, at Wandsworth, in January last, first revealed the

mismanagement and confusion that prevailed in the internal organization of that institution, it was considered desirable that a Ladies' Committee should be formed, which would visit the school, and report to the Executive the result of their observations on each occasion.

These visits of the Ladies' Committee having successively brought to light a variety of circumstances tending to prove the total want of judgment and discretion of the Chaplain and Superintendent (some of these of a nature so opposed to all notions of delicacy and propriety as to betray their general unfitness for the responsible charge of female orphans), and also their frequent departure from the rules and regulations appointed for their guidance in the management of the school, *eight* of the Ladies' Committee recorded to the Executive their opinion of the inefficiency of these officials, and their unwillingness to act with persons whose ideas on the subject of female training and moral education were so highly erroneous and objectionable, and who had displayed such want of energy and resource when a system of thieving had long prevailed in the school, both as to making any efforts to trace the offenders, and as to any endeavours to impress upon the minds of the children a sense of the gravity of their offence.

The ladies were also of opinion that the head of such an institution should have been a woman (more properly a widow and a mother), a person of self-reliance and decision of character, who would not have delegated her authority to servants or others, but have endeavoured to influence her youthful charge by the exercise of a firm moral control.

In consequence of these representations, the ladies received an assurance that the whole institution should be placed on a better footing, and they suspended accordingly the exercise of their functions until they should learn the result of the gentlemen's decision.

It is now, therefore, both with surprise and regret, that they learn that the same objectionable officials are to be retained, and that the gentlemen's intended reforms will be confined to a new list of rules and regulations, and some changes as to the relative authority of the existing Chaplain and Superintendent.

As the only objects which the ladies have in view are the safety and welfare of the three hundred orphans for whose maintenance the nation has so munificently provided, and as they feel that by the retention of the present Superintendent and Chaplain these objects will be sacrificed to what appears to them to be a very secondary consideration, namely, the unpleasantness of the task of dismissing incompetent officials,—

We, the undersigned, beg to state our conviction that, as members of a Ladies' Committee, we could not have been of any use to such an institution unless we had possessed sufficient moral courage to report our opinions honestly to the Executive Committee, even when we had reason to believe that some of its members did not agree with us in our notions of the kind of management suitable in a female asylum for education.

If we had abstained from the expression of our conscientious convictions, we should not only have been guilty of neglecting a sacred duty, but our functions would have been reduced to a mere farce.

Under these circumstances, feeling ourselves utterly powerless to accomplish any good, and hopeless of obtaining redress for any abuses we might hereafter detect in the establishment, we find ourselves under the necessity of declining any longer to sanction with our names a system of management of which we so entirely disapprove, and which cannot, in our opinion, either honestly and faithfully carry out the benevolent intentions of the founders of the Victoria Patriotic Asylum, or do justice to the munificent contributions of the nation towards the orphans of its Crimean heroes; and we have therefore to request the Executive Committee to have the goodness to erase our names from the list of the Ladies' Committee for the Victoria Patriotic Asylum at Wandsworth.

(Signed by) Lady Colchester.
Mrs. Adair.
Mrs. Cook.
Mrs. Prescott.

After discussion, the following was adopted by another portion of the Ladies' Committee:—

10th May 1862.

We fully concur in the sentiments expressed in the subjoined letter, and we only wish to defer our resignation until we see whether the Royal Commissioners, to whom we understand a reference will be made, adopt the view of your Committee.

The Report made to our Committee is so utterly at variance with our own feelings upon the various occurrences which have come to light, that under any circumstances we should feel some hesitation in continuing to act on the Committee.

We entirely dissent from the course followed by your Committee, as, under the present serious circumstances, we can hardly consider an original "want of previous experi-" ence" is sufficient cause for retaining the present officials, after nearly four years entire control on their part; and we further think that the persons intrusted with so serious a responsibility ought to be persons of experience and sound discretion.

We can only regret that the whole of these very painful and delicate circumstances had not been ascertained and rectified previous to the formation of the Ladies' Committee.

Signed by— The Hon. Miss Sugden.
Mrs. Brown.
Miss Coutts.

The remaining portion of the Committee adopted the following:—

10th May 1862.

As an appeal is going to be made to the Royal Commissioners, we, the undersigned ladies, wish to reserve our decision until the answer from those gentlemen has been sent to us.

Signed by— Lady Sarah Lindsay.
Mrs. Wellesley.
Mrs. Lefroy.

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## Appendix VI.—*cont.*

### Additional Papers.

*Printed at the Request of the Committee of Ladies, at their Meeting of 26th June* 1862.

Letter from Chairman of Executive and Finance Committee.

Madam, 25th June 1862.

The Report of the Executive and Finance Committee having been laid before the Royal Commissioners on Friday last, the 20th instant, I beg to enclose, for the information of the Ladies' Committee, that portion of it which relates to the Royal Victoria Patriotic Asylum, and would request the particular attention of the ladies to the concluding paragraph thereof (No. 26).

After a lengthened discussion the Report was adopted by the Royal Commissioners, the accompanying Resolution having been put to the meeting and negatived.

I have also enclosed a copy of the new rules for the government of the Asylum, a copy of which will be furnished to each member of the Ladies' Committee as soon as they have been printed in a more convenient form.

I have, &c.
(Signed) Colchester,
Chairman of the Executive and Finance Committee.

To the Lady presiding at the meeting of the
Ladies' Committee of the Royal Victoria
Patriotic Asylum.

Copy of Resolution alluded to in foregoing Letter.

"That the facts which have been elicited show that "there have been faults in the management of the insti-"tution, which render it expedient that there should be a "change in the persons placed at the head of the Victoria "Asylum."

At a meeting of the Ladies' Committee, held at the Office of the Patriotic Fund, 19, New Street, Spring Gardens, on Thursday, 26th June 1862.

PRESENT:

Lady Sarah Lindsay (President).
The Hon. Mrs. Wellesley.
The Hon. Miss Sugden.
Mrs. Fishbourne.
Miss Coutts,
Mrs. Lefroy.
Mrs. Brown.

The minutes of the last meeting were read and signed,

Resolved unanimously:—

That the Ladies' Committee are of opinion that the printed Minutes, as furnished to them, do not contain the whole of their representations, some of which they consider of importance. They therefore now request that the omission may be supplied, and the Minutes, Nos. 7, 8, 9, 10, and 11, of the 1st April, and the last Minute of

10th May, may be printed, and that the names of the ladies as recorded in the minutes, and of the ladies who signed the several letters, may be furnished to the Royal Commissioners.

Read the following letter from the Chairman of the Executive and Finance Committee, dated 25th instant, with its enclosures:—

(*Vide* letter on page 12.)

The following Resolution was proposed by LADY SARAH LINDSAY, and after discussion it was deferred to the next meeting of the Ladies' Committee.

Subsequently the ladies whose names follow it, attached their signatures to record their approval, in the event of their being unable to attend at the next meeting.

"The Executive Committee, having minutely inquired "into the management of the Royal Victoria Patriotic "Asylum, and amended the regulations, and established a "more complete system of supervision, and having come "to the unanimous conclusion that there are not sufficient "grounds for calling upon the Lady Superintendent and "Chaplain to resign their offices, and the Royal Com- "missioners having confirmed that decision by a majority, "the undersigned place their services at the disposal of "the Executive Committee, in whatever manner may be "most conducive to the interest of the institution; at the "same time the undersigned submit for the consideration "of the Executive Committee, that by the selection of "ladies whose avocations and place of residence might "enable them more frequently to confer with the Super- "intendent upon the domestic concerns of the Asylum, a "more efficient supervision might be attained.

(Signed) "SARAH E. LINDSAY.
"CHARLOTTE ANNA LEFROY.
"ELLEN M. FISHBOURNE.
"M. WELLESLEY."

Resolved:—

That the Ladies' Committee postpone their answer to the communications of the Executive Committee until they have had more time to consider them; in the meantime they request that the first Resolution may be submitted to that Committee before the next meeting, on the second Tuesday in July.

At page 17 of the papers marked "Private and Confi- "dential for the information of the Royal Commissioners," Miss Coutts is the lady alluded to as having requested to see the punishment book.

Page 18 of the same papers, the eight ladies who signed the letter of the 27th March were:—

| | |
|---|---|
| LADY COLCHESTER | MISS COUTTS. |
| The HON. MRS. WELLESLEY. | MRS. COOK. |
| The HON. MISS SUGDEN. | MRS. BROWN. |
| MRS. ADAIR. | MRS. PRESCOTT. |

Page 21, paragraph 6, middle clause, the two ladies alluded to are:—

LADY SARAH LINDSAY, and
MRS. LEFROY.

Page 21, paragraph 6, last clause, the lady who dissented was,—

MRS. FISHBOURNE.

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Page 21. The following is a continuation of the Meeting of the 1st April:—

| From Minutes of Ladies' Meeting, 1st April. | Remarks or Decision of Executive and Finance Committee, 12th April 1862. |
|---|---|
| 7.—Mrs. Adair stated to the Ladies' Committee that, on her visiting the Royal Victoria Patriotic Asylum last week with Mrs. Prescott, they were surprised on inquiring for Mary A. Lane, the pupil-teacher (whose desk had been stolen previously, and replaced during the ladies' meeting), to find that she was absent, having been allowed to go for a holiday; the ladies therefore beg to record their opinion of the impropriety of allowing a girl to leave the Asylum, pending an inquiry into anything with which she was connected. | |
| 8.—The Ladies' Committee beg to suggest, for the consideration of the gentlemen, the question of girls returning to the Asylum and mixing with other girls, after they have once been in service, such a course, in their opinion, being open to grave objection; and Miss Coutts stated that, in the case of one institution, she had tried it during the time she was connected with it, under circumstances likely to prove favourable, but it entirely failed of producing the good result she had anticipated. | The Committee will not permit any girl who has been engaged as a servant to return to the Asylum as an inmate without special leave obtained from the Committee at one of their monthly meetings. |
| 9.—The ladies further beg to suggest, for the consideration of the Executive Committee,—<br>(*a.*)—Whether or not the girls are retained in the Asylum to too great an age.<br>(*b.*)—Whether the children being allowed to go home to their mothers for the holidays is not calculated to prove injurious to the best interests of the children. | A return has been called for of all girls of 16 years of age and upwards, with a view of removing them from the Asylum.<br>Permission to go home must hereafter be subject, in each case, to the approbation of the Committee, according to the conduct of the mother and child. |
| 10.—The ladies desire to know the position of the medical man of the institution, whether his wishes and instructions are at all times attended to, and whether in the cases of two girls, who, they have heard, used to come to London to be mesmerised, such a course was sanctioned by him. | [Dr. Paul, (the medical officer), having been called in, stated, in reply to questions, that he visited the Institution every day, except Sundays, and then if necessary; that his wishes were at all times attended to; that he heard of girls being sent to London to be mesmerised—they were not sent by his sanction; was under the impression that the instructions for the girls to be mesmerised came from the Committee; that he had been assisted in every way by Captain Fishbourne and Miss Clavell; and that everything in his department was now working like clockwork.]<br>[Captain Fishbourne stated that, having found a girl lying faint on the grass, suffering in the same way as a boy who had been cured by mesmerism, he authorized her to be sent to London to be mesmerised, and he believed the nurse went with her.] It occurred in the latter part of 1859—the girl was sent to the Mesmeric Infirmary.<br>Resolution 3.—The Committee disapprove of any medical treatment of inmates of the Asylum, except under the direction or with the sanction of the medical officer of the establishment. |
| 11. The ladies also think it right to mention to the Executive Committee, that a lady told two of their body that, having tried two or three girls from the Asylum, she had been so disappointed at the manner in which they had conducted themselves, that she certainly would not, for the present, be induced to make trial of another. | |

MINUTES OF LADIES' MEETING, 10th MAY 1862.

The four signatures to the letter terminating on page 25 of the printed papers marked "private and confidential," were those of :—

LADY COLCHESTER. MRS. COOK.
MRS. ADAIR. MRS. PRESCOTT.

The three ladies who signed the statement on page 26, were :—

THE HON. MISS SUGDEN.
MRS. BROWN.
MISS COUTTS.

And the remaining portion of the Committee who signed the short statement beginning "As an appeal," were :—

LADY SARAH LINDSAY.
THE HON. MRS. WELLESLEY.
MRS. LEFROY.

Resolved unanimously :—

That a request be made to the Executive and Finance Committee for the whole of the Minutes of the ladies' meetings, and of the replies and observations of the Executive Committee thereon, to be printed; and that a copy may be furnished to each member of the Ladies' Committee.

At a meeting of the Ladies' Committee, at the Royal Victoria Patriotic Asylum, on Tuesday the 8th of July 1862,

PRESENT :—

MISS COUTTS (President).
THE HON. MISS SUGDEN.
MRS. FISHBOURNE.
MRS. BROWN.
MRS. LEFROY.

The Minutes of the last meeting were read and confirmed.

Mrs. Fishbourne stated that she had received a note from Major-General Lindsay, expressing the regret of Lady Sarah Lindsay at her inability to attend the meeting from indisposition, and signifying her desire that her name should be attached in the event of the resolution as originally proposed at the last meeting being again submitted for consideration, and which contained the words, "The Ladies' Committee having now learnt that upon "many points they have been misinformed," it was resolved by the following ladies that they do not desire the reinsertion of those words, as they are of opinion that there has been nothing adduced to show that the Ladies' Committee had incorrect information, as fully proved by the Report of the Executive and Finance Committee, and the new bye-laws, in which they are pleased to find that the Committee have taken cognizance of nearly every representation of the Ladies' Committee.

ANGELA G. BURDETT COUTTS.
CHARLOTTE SUGDEN.
CHARLOTTE ANNA LEFROY.
HANNAH BROWN.

Mrs. Fishbourne did not sign, as she considered it important to consult Lady Sarah Lindsay.

Resolved unanimously :—

The Ladies' Committee desire to call the attention of the Executive and Finance Committee to the second section of the 19th paragraph of their Report to the Royal Commissioners, in which they convey the impression that the ladies' opinion of the punishment having been unsuitable and severe was limited to corporal punishment, whereas the ladies never used the word "corporal," but expressed their opinion of the punishment in general.

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The following letter was adopted by Miss Sugden, Mrs. Brown, and Miss Coutts :—

TO THE EXECUTIVE AND FINANCE COMMITTEE.

8th July 1862.

We, the undersigned ladies, in announcing our intention to join the four ladies who have already resigned, namely, Lady Colchester, Mrs. Adair, Mrs. Prescott, and Mrs. Cook, in withdrawing our names from the Visiting Committee of Ladies of the Royal Victoria Patriotic Asylum, beg as briefly as possible to refer to the circumstances under which the committee was appointed, and to the facts which have led us to the conclusion that the true interests of the children of the Institution would not be secured under the management of the present Superintendents of the Asylum, and that we cannot therefore continue to act with benefit to them or satisfaction to ourselves.

The Ladies' Committee was appointed by a resolution dated the 25th of January 1862, as we now learn by the Report just issued for the information of the Royal Commissioners, and, we have been informed, in consequence of the irregularities which had taken place in the Asylum, and which had to a limited extent come to the knowledge of the Executive and Finance Committee, through the frightful occurrence of the death by fire, in the early part of January 1862, of a young woman named C. J. Bennett, acting as servant in the Institution, and who was placed in solitary confinement for some offence—we believe, rudeness to the laundress.

At the second meeting held by the ladies at Wandsworth, the general mismanagement and want of proper discipline in the Asylum became very apparent from circumstances which then transpired. Amongst these may be mentioned—

First—The existence of petty thieving and pilfering, which were admitted to have prevailed for a length of time, and the following fact may be stated as affording proof that such habits existed, and that there had been apathy and negligence on the part of the authorities. While the Committee of Ladies was actually sitting and making inquiries on the subject of thefts, a desk, which had been stolen from a pupil-teacher's room some time six weeks before, was replaced in her room.

Secondly—The allowing young girls to go out alone on the common, and also to London and Woolwich. On one occasion two young girls—one of them to be mesmerised—were sent up to London by themselves.

Thirdly, the fact that corporal punishment had been inflicted on a girl nearly sixteen, by order of the Chaplain, acting under Captain Fishbourne, and carried out by the Lady Superintendent herself, on the refusal of the servants to obey the order.

These facts were brought under the notice of the Executive Committee, and subsequently eight of the ladies expressed their unwillingness to act with those to whom the Executive had intrusted the management of the institution.

To this communication the ladies received an answer on the 10th May, in which they were informed that the Executive Committee "disapprove and regret the conduct of the "Lady Superintendent and the Chaplain in some instances; "but considering the peculiar circumstances under which "the schools have been carried on in the absence of regular "inspection, excepting that of the senior honorary secre- "tary of the Royal Commission, the Committee are of "opinion that a recurrence of these faults may be prevented "by improved regulations and proper inspection, and that "therefore it is not necessary to proceed to the extreme "measure of now calling on the Lady Superintendent or "the Chaplain to resign their situations. In arriving at "this decision the committee show that they are not insen- "sible to the objectionable nature of the facts brought to "their notice by the Committee of Ladies; they also state "they feel bound to make allowances for the want of pre- "vious experience on the part of both the Lady Super- "intendent and Chaplain."

Upon the receipt of this reply, Lady Colchester, Mrs. Adair, Mrs. Prescott, and Mrs. Cook resigned, feeling with us that the disqualification of inexperience, and the absence of regular supervision, could scarcely be accepted as excuses after four years' trial, even supposing inexperience at the first were admissible in the management of children in matters which were not mere errors of judgment, but of common sense and feeling.

The six* remaining ladies of the Committee, of whom the three undersigned fully concurred in the sentiments of Lady Colchester's letter, decided not to act until the decision of the Royal Commissioners should be known, considering it probable that they would adopt the course usually followed in public institutions according to our experience, when there has been a failure in the management.

We rejoice to find, by the revised rules and bye laws, that the Executive Committee have admitted the force of the principal facts stated by the Ladies' Committee, and that they have seen the necessity of greatly altering the rules and regulations of the asylum; but we consider it is more than probable, however good these rules may be, that those who allowed such evils will relapse into their former habits of mismanagement and indifference, nor can we anticipate that those who for four years have acted together should now in such different relative positions carry out new regulations, with a due sense of their own responsibility, free from the influences to which they have so long submitted; moreover, we hold the opinion that no clergyman

---

* *Note by Executive Committee.*—This passage refers only to the ladies of the Committee then present; "the remaining ladies of the Committee" were, in fact, nine.

or lady can be fitted for so delicate and responsible a task as the education of children who are satisfied to give as a reason for their conduct that they acted under the authority of Captain Fishbourne, "to whom, as stated in "writing by the Chaplain, everything that happened or "was done, of the most trivial description, was made "known, as their only means of communication with "their rulers, and whose decision was considered by them "to be final, and his arrangements indisputable, whether "according to their views or not."

At a meeting of the ladies still remaining on the Committee, which took place on June 26th, we were informed that the majority of the Royal Commissioners present at their last meeting adopted the view of their executive, in retaining the Lady Superintendent and the Chaplain; we therefore consider that we have no alternative but to resign, as we feel that, anxious as we are for the welfare of the children for whom the nation has so generously provided, our co-operation cannot be useful whilst such a difference of opinion and feeling exists. But before our connexion with the asylum finally ceases, we venture to express our regret that we find in the new rules for the asylum no guarantee against the unsuitable and exciting religious meetings (partaking apparently of the character of revivals) which caused hysterical affections among the girls, and which, we have been informed, were permitted by the Chaplain, though we have no means of judging whether they were held with his own approval, or under the orders of the gentleman to whom alone he seems to have considered himself responsible.

(signed) Charlotte Sugden.
Hannah Brown.
Angela G. Burdett Coutts.

Since our letter of resignation was written we have received a copy of the omitted portions of our Minutes. We regret that the Royal Commissioners did not see them before they came to a decision on those parts before them, and we request that, for our justification in declining to act further with the present management, the printed sheets of the omitted Minutes and a printed copy of our letter of resignation may be sent to the Duke of Newcastle and to the Royal Commissioners, and we shall be glad to be informed when this has been done, as this is the last meeting we shall attend. We think it advisable to send a copy of this letter to the Duke of Newcastle, as Chairman of the Royal Commissioners.

(signed) Charlotte Sugden.
Angela G. Burdett Coutts.
Hannah Brown.

When printed, we shall be glad to be furnished with copies of the proceedings of this last meeting, in order that the series of papers in our possession may be complete.

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Royal Commission of the Patriotic Fund,
19, New Street, Spring Gardens, S.W.

Madam, 15th July 1862.

At the request of the Committee, I have the honour to enclose, for your information and that of Mrs. Brown and Miss Coutts, a copy of the Minute which has been this day unanimously adopted by the Executive and Finance Committee, in reply to the communication of the 8th instant, in which you and the two ladies above mentioned announced your retirement from the Ladies' Committee of the Royal Victoria Patriotic Asylum.

I have, &c.
(signed) Colchester,
Chairman of the Executive and
The Hon. Miss Sugden. Finance Committee.

---

(Copy) Colchester, Chairman.

Minute of 15th July 1862.

The Executive Committee have received with extreme regret the communication of Miss Sugden, Mrs. Brown, and Miss Coutts, dated 8th July, intimating their intention, in consequence of the decision of the Royal Commissioners with respect to the proposed dismissal of the Lady Superintendent and Chaplain, to retire from the Ladies' Committee.

The Committee well know the benevolent motives which have influenced the members of the Ladies' Committee in all their acts, and desire, as much as heretofore, to abstain from argument and controversy upon a subject which has given them so much pain; and upon which, in its whole bearing, the Royal Commissioners have now pronounced their judgment in confirmation of the unanimous report of the Committee.

The Committee, therefore, will not refer to the assumed reasons for the appointment of the Ladies' Committee, nor to other parts of the letter before them, which relate to points already decided, but will pass to the consideration of the allegations of a want of due supervision of the children in their absence on temporary leave or for medical treatment.

The three retiring ladies urge, in support of their views, "that young girls have been allowed to go out alone on the "common, and to London, and to Woolwich; and that on "one occasion two young girls, one of them to be mesme-"rised, had been sent to London by themselves." With respect to these statements, the ladies appear to have been misinformed. The Committee have inquired into the circumstances. They find that sometimes pupil teachers were sent out to shops, or the portress to the post office, but otherwise young girls were not sent out alone either upon the common or elsewhere; nor were they sent alone to London or to Woolwich, except in the cases of girls going home to their mothers, with the knowledge and by the desire of those mothers; nor were two girls sent to London by themselves for one to be mesmerised, except on some occasions when the nurse was occupied at home, and a steady servant girl was selected in her stead; otherwise when girls were sent to the mesmeric or other hospitals, they went under the care of a nurse. The visits to the Mesmeric Hospital were under circumstances which exonerated the Lady Superintendent and Chaplain, but the Committee disapproved of them, and they cannot occur again, unless directed by the medical officer.

It does not appear to the Committee that the reference made by these ladies to "the unsuitable and exciting "religious meetings" has much, if any, bearing upon the object of their letter, viz., to explain why they must retire because the Lady Superintendent and Chaplain were not dismissed.

The ladies admit that they "had no means of judging "whether the religious meetings were held with the Chap-"lain's approval," but they do not mention the Lady Superintendent, and the Committee are therefore bound to state that Miss Clavell disapproved of them, and expressed that disapprobation at the time.

The statement that the religious meetings referred to "caused hysterical affections," the Committee believe to be unfounded.

There have been cases of hysterical affection in the institution both before the religious meetings commenced and since they were discontinued, but the Committee cannot ascertain that any such affections can be traced to those meetings.

But the Committee have disapproved of those meetings; they have made the Chaplain directly responsible for all religious teaching; and they have made regulations which are entered in their own Minute Book, and which have been communicated to him, and by which he must abide.

In the letter of 10th May the retiring ladies say: "Feeling ourselves utterly powerless to accomplish any "good, and hopeless of obtaining redress for any abuses "we might hereafter detect in the establishment, we find "ourselves under the necessity of declining any longer to "sanction with our names a system of management of "which we so entirely disapprove."

In a resolution passed by the three ladies who have last retired, on the day on which the letter of resignation now before us was adopted, they refer to "the new byelaws in "which they are pleased to find that the Committee have "taken cognizance of nearly every representation of the "Ladies' Committee."

The Committee rejoice that the opinions entertained by these ladies on 10th May have been so far modified, but the Committee regret the more deeply that they have not thought it right to await the effects of the improvements which they admit, and have considered it their duty to persevere in demanding the expulsion of the principal officers, for reasons which seem now to be reduced to the opinion that "it is more than probable, however good the new rules "may be, that those who allowed such evils will relapse into "their former habits of mismanagement and indifference, "&c. &c."

# APPENDIX VII.

SENIOR SCHOOL.—The girls have been carefully instructed in elementary subjects, and their attainments are in general quite sufficient to enable them to do their duty in the situations which they are likely to occupy. They can keep accounts correctly, write an intelligible letter, and read with fluency and fair intelligence any book likely to be of use to them.

They have a good knowledge of the text of Holy Scripture, and their tone under examination is reverent, and indicates religious feeling.

The manners of the girls are pleasing; they are somewhat timid, excepting when examined by the Chaplain.

I do not consider that they are so neat and cleanly as might reasonably be expected. There is some improvement, but greater attention should be paid to this most important matter.

MIDDLE SCHOOL.—This school was conducted with ability by Miss Branen, lost ground under her successor, but with careful and able teaching it may be soon raised to a satisfactory condition, so far as regards all subjects of elementary instruction.

The children are intelligent, read with ease and fluency, write very fairly on paper from dictation, and have made fair progress in arithmetic. Their religious knowledge is good, and sufficiently extensive.

There is room for improvement in habits of personal neatness and cleanliness. I have called the attention of the Mistress and Lady Superintendent to this point.

INFANTS.—The children are getting on very fairly. The present Mistress is thoroughly conscientious, and pays due attention to elementary subjects.

The needlework is carefully inspected by the Superintendent in all these schools.

The Chaplain has evidently worked hard and successfully in all the schools.

The Pupil Teachers are not very efficient, and some of them may be displaced.

PATRIOTIC FUND.

# THIRD REPORT

OF THE

# ROYAL COMMISSIONERS

OF THE

# PATRIOTIC FUND

TO

# HER MAJESTY THE QUEEN.

*(Presented to Parliament by Her Majesty's Command)*

*Ordered, by* The House of Commons, *to be Printed,*
2 *June* 1863.

313.

# APPENDIX

TO THE

# REPORT OF THE COMMISSION

FOR

# IMPROVING THE SANITARY CONDITION OF BARRACKS AND HOSPITALS.

(INTERIM REPORTS.)

**Presented to both Houses of Parliament by Command of Her Majesty.**

LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1863.

2983.

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# APPENDIX

TO THE

# REPORT OF THE COMMISSION FOR IMPROVING THE SANITARY CONDITION OF BARRACKS AND HOSPITALS.

## INTERIM REPORTS ON BARRACKS AND HOSPITALS.

### I.—LONDON DISTRICT.

SIR,

IN compliance with instructions received from Lord Panmure, we have inspected the several barracks in the London district, and inquired into their sanitary condition, and we have now the honour of transmitting this *interim* report on the more important sanitary defects which have come under our observation.

The following is a list of the barracks we have examined within the London district :—

1. Wellington barracks.
2. St. George's „
3. Waterloo „ Tower.
4. St. John's Wood „
5. Portman Street „
6. Magazine, Hyde Park.
7. Knightsbridge Cavalry barracks.
8. Regent's Park „
9. Old Cavalry barrack, Kensington.
10. Old Infantry „ „
11. New Cavalry and Infantry, Kensington.
12. Windsor Cavalry barrack and hospital.
13. „ Infantry „ „
14. Hampton Court Old Cavalry barracks.
15. „ „ New „ „
16. Guards' barrack and hospital, Croydon.
17. Hounslow Cavalry barrack and hospital.

To enable us to estimate the comparative healthiness of the different Guards' barracks, we requested Dr. Balfour to prepare for us a statement of the sickness and mortality in those within the metropolis for seven years from 1847 to 1854, from which it appears that the mortality in the different barracks has ranged as follows :—

| | Deaths per 1,000 of Strength. |
|---|---|
| Tower | 17·81 |
| Portman | 15·17 |
| St. George's | 15·12 |
| St. John's Wood and detached barracks | 14·70 |
| Wellington | 13·33 |

This death rate is very much what might have been expected from the sanitary condition of the different barracks.

Perhaps a more important test of the sanitary condition of these barracks may be derived from the admissions into hospital from diseases usually connected with sanitary defects. The following table exhibits the admissions into hospital per 1,000 of strength from the more prominent zymotic diseases for the same seven years :—

| —— | Fever. | Diarrhœa. | Zymotics. |
|---|---|---|---|
| Tower | 71·08 | 104·96 | 176·04 |
| Portman | 53·19 | 53·40 | 106·59 |
| St. George's | 47·21 | 54·05 | 101·26 |
| Wellington | 44·78 | 49·88 | 94·66 |
| St. John's Wood and Detached Barracks. | 43·06 | 44·32 | 87·38 |

This table shows approximately the loss of efficiency from zymotic diseases, which are known to arise chiefly from impurities of the air, produced by overcrowding, defective ventilation, and nuisances.

Before proceeding to show to what extent these predisposing causes exist in the different barracks, we shall state briefly the general nature of the sanitary defects of the establishments in this district.

The barracks in the London district, exclusive of the new barracks at Kensington, not yet occupied, and the two small old barracks there which are about to be abandoned, furnish accommodation, according to the barrack-master's returns, for 4,232 men.

Some of the barracks, such as those of New Kensington, Tower, Wellington, and St. John's Wood, although of comparatively recent erection, do not exhibit those advances in healthy structural arrangements that might have been anticipated. Portman barrack, Knightsbridge barrack, and both the Old Infantry and Cavalry barracks at Kensington are much out of repair, and of bad construction.

The sites of some barracks, St. George's, Knightsbridge, and Portman Street especially, are more or less objectionable, on account of their being in the immediate vicinity of dense populations, or surrounded by lofty buildings which impede the circulation of air about them.

There is one defect common to all, even to the newest barracks, and that is, a very deficient amount of window space, and there are, moreover, important structural defects of other kinds. The large increase of window space in dwelling houses of modern construction in the last few years is very remarkable. But it has been met by no corresponding increase of window space, even in the most recently constructed barracks. A cheerful room means a light room, and in the lightest the inmates generally so place themselves as to obtain the greatest amount of light from the windows. In a room inhabited, as in a barrack, by 16, 18, or 20 persons, who cannot all sit close to the windows, the light should pervade the whole room as much as possible ; nor would this increase of light entail any expense, but the contrary, for in buildings of solid construction the window space is less costly than the masonry of the wall.

Generally, the staircases in the metropolitan barracks are much too narrow, and the ablution-rooms, bath-rooms and kitchens are defectively planned and constructed.

As an example of this, we may notice that in the New Kensington Cavalry barrack, the most recently constructed barrack in the London district, the kitchen and ablution-rooms, exposing a large wet surface, are placed on either side of the upper landing of one of the principal staircases, at the entrance to the corridor which communicates with every room in the barrack.

We may also point to a repetition in this barrack, of a very questionable arrangement—that of placing the rooms of the men over the stables. The arrange-

ment may be convenient, but as relates to health, it should always be avoided, if possible.

We shall afterwards give the details of accommodation in each barrack; but we may state here generally that, in six of the principal and largest barracks, we find the cubical space per man to range from 341 feet, the minimum (in St. John's Wood), to 690, the maximum (in Regent's Park).

The average in the Wellington barracks is 500; in St. George's, 520; in St. John's Wood, 341; in the Tower, 483; in Regent's Park, 690; in Knightsbridge, 458; about 380 in the Magazine barracks, Hyde Park; in Portman Street, 374.

We have reason to believe that even this moderate cubic space is liable to considerable reduction, according to the wants or distribution of different regiments.

Captain White, the barrack-master of the Wellington barracks, states in his return, that "the present "requirements of the head-quarters of a regiment "not being sufficiently provided for when barracks "are built, misappropriation takes place, and con- "fusion and discomfort ensue." "The orderly-rooms, "reading-rooms, tailors' and shoemakers' shops, "quarters for regimental staff serjeants, as marked "by authority, are so often insufficient for their "purposes as almost to force the misappropriation of "the soldiers' sleeping-rooms. This is the case at "present."

Captain White further states:—"The barrack- "master cannot alter the 'construction' sent to him "by the Inspector-General of Fortifications, or the "'occupation' sent to him by the commanding officer. "One deducted from the other is called available "accommodation, when in reality it is nothing of the "kind."

The largest amount of cubic space now allotted by regulation in infantry barracks is not sufficient to maintain health, and when the space is extended to 600 cubic feet as directed in our instructions, this space ought to be considered as no more subject to diminution than is the soldiers' diet.

It is true that no amount of space can give security to health in a polluted, stagnant atmosphere. It is, however, the only means of rendering such an atmosphere less dangerous, and no class of barracks requires it so abundantly as those in towns. Stillness of atmosphere, produced by high walls, multiplicity of buildings, small courts, culs-de-sac, and other obstructions to free perflation, as well as atmospheric impurities arising from the greater accumulation of decomposing matter, necessarily consequent on increasing the population on a given surface, can only be compensated by the most liberal allowance of cubic space, and the best sanitary arrangements of every kind possible under the circumstances.

We think, therefore, that commanding officers should be instructed that no misappropriation of sleeping-rooms can be sanctioned for any reason whatever.

We have found a very general adoption of the common methods of ventilating, either by ventilators in or near the ceiling of rooms, in the centre of floors, or in the skirting. In some rooms Dr. Arnott's ventilator in the flue of the chimney is added. But in no one instance is there any satisfactory method in use for supplying a sufficiency of pure air, and at the same time preventing draughts.

In most of the attempts to ventilate the London barracks, the principle has been followed of admitting fresh air at or near the level of the floor, and providing more or less effectually for the escape of heated air above; but the position of the inlets is objectionable from their introducing cold air among the men's feet, while no provision has been made for breaking up the current or for diffusing the air. As a consequence the ventilation is universally imperfect by the lower ventilators being interfered with by the men, and not unnaturally so when the orifice is barely six inches from the bed on which the soldier is lying, and the stream of fresh air, which is to supply 18 or 20 men, blows directly on one.

It appears to us that the walls and ceilings of the barrack-rooms are not cleaned often enough for health, and we therefore recommend that quick-lime washing should be used at least twice a year in all barracks.*

In addition to the evils of defective ventilation, the air in barrack-rooms is further deteriorated by the use of gas-light, without any means of carrying away the effluvia from the burners.

The latrines in the London district admit of being flushed into main sewers. They are not always well constructed; they are dark, damp, and noisome.

The evils are in some instances aggravated by the urinals being placed in the same confined buildings with the latrines, and being unsupplied with water for purification.

The privies at the Wellington barracks are placed in the centre of the inner yards, with urinals in the same building. The building covering them is badly ventilated and lighted, and any effluvia from the latrines and ash-pit must necessarily diffuse themselves through the still atmosphere of the court, already too confined from the nature of the buildings.

In common with all others, except that at St. John's Wood, the latrines at Wellington barracks are open to the objection of having the soil receptacle too broad and too deep, and in consequence there is an unnecessarily large surface left for noisome exhalations. The sides too, which the water cannot reach, become rough and filthy, not admitting of being kept clean. Their internal arrangements have been planned without sufficient regard to decency, there being no divisions between the seats. In the new barracks which we have seen at Portsmouth and Aldershot, this latter evil has been avoided.

The sources of impurity in a barrack are so numerous, the facilities for their accumulation often so much greater than those for their removal, that all filth or refuse ought to be immediately removed, and ash-pits and other similar receptacles upon the scale now used, and near the buildings, should be abolished.

In the case of barracks situated in towns, the ash-pit, if moved away from the barrack-rooms, is probably brought into close proximity with some other buildings, the inhabitants of which are as injuriously affected as were the troops, and the ash-pit is objected to accordingly.

The great evil of these ash-pits is, that they permit and in fact provide for, the accumulation of decomposing refuse close to barrack-rooms. They are generally capacious, and expose a large surface; they are not judiciously placed in relation to the barrack-rooms, and they are universally uncovered.

The last circumstance may be taken as proof of the little suspicion attaching to these places of deposit, though in reality they are dangerous to health, especially in the vicinity of crowded buildings.

The utmost vigilance cannot prevent vegetable and other decomposing matters, as well as ashes and dust, being thrown into them, as also slops of all kinds. These, aided by alternate rain and sun, are known to generate emanations injurious to health.

The only safe principle on which to dispose of the refuse of barracks, is to remove it at once and completely; the present practice is to remove part, and that, of course, the upper part, at the convenience of the contractor, which results in the most dangerous portion, namely, the lowest and the oldest stratum being left in the ash-pit.

Daily removal of the whole ought to be insisted on. We therefore recommend that each large barrack

* See Warrant and Barrack Regulations, Instructions relating to Buildings, Art. 186, and App. No. 16, Arts. 4 and 9.

should be provided with two iron carts, each capable of containing the daily refuse, one of which should remain at the barrack as a receptacle for the refuse, to be taken away and emptied every morning, when it would be replaced by the empty one.

In the barracks of the London district the construction and position of the lavatories are not what they ought to be for health.

These washing-places are a modern concession to cleanliness. The older barracks were not originally provided with any room for the purpose, out-door ablution at the pump being then the practice.

The coldest, gloomiest, and least eligible part of the building is generally allotted to them, namely, the basement. They are, in consequence, distant from the majority of the sleeping-rooms, and must be reached through cold and gusty passages. To be thus suddenly transferred from a hot and close barrack room to a cold, gloomy cellar, saturated with moisture, would require constitutions of iron : it is an unnecessary risk to health, and a wear and tear not in any way required by the service.

The evil does not stop here. The free use of cold water, the best protection against the effects of early morning exposure to weather, is apt to be only partially resorted to, or probably altogether dispensed with, at the proper hour by the men whose constitutions are most sensitive to the effects of damp air and rapid changes of temperature.

The arrangements for bathing are equally defective. At the Wellington barracks, where there are five baths for 1,500 men, we are informed that a large number of men may sometimes be seen waiting for their turn. Encouragement should be given to any disposition to cleanliness, as not only the comfort and health of each individual is thereby promoted, but greater purity is ensured in the atmosphere of barrack-rooms, the state of which is greatly affected by the want of personal cleanliness of individuals sleeping in them. When sufficient accommodation for bathing shall have been provided, we venture to suggest that it would be desirable that means should be taken, subject to medical control, to ensure that every soldier should wash his whole person once a week.

We have found libraries provided in most of the barracks. In all such instances they are objects of care and attention. But, in several instances, the ventilation and lighting of these libraries are exceedingly defective.

In the Wellington, St. George's, and Tower barrack, good-sized school-rooms and convenient fittings have been provided on a plan supplied by the chaplain-general.

The infant schools are not so well accommodated ; the rooms are generally small in proportion to the number of scholars. In several instances the ventilation of the day and infant schools is very defective, and the air is, in consequence, close and impure.

Except at the Portman and St. John's Wood barrack, in which the want has been accidentally supplied by a disused riding school, there is not a day-room in any of the London barracks.

Such a room, we consider, is required in every large barrack as a place of recreation, and perhaps it might be used as a refectory. It would obviate the necessity of making-up the beds before they have been aired and even before they are cool, in order to enable the men to breakfast, and would thus conduce to the purity of the barrack-rooms and the health of the men.

We have found accommodation set apart for married soldiers within several of the barracks. But the sanitary condition of the rooms is not sufficiently attended to.

The rooms specially designed for married non-commissioned officers are often much too small for families. They are generally placed in confined and badly ventilated parts of the barracks.

At Knightsbridge the married privates, as also the non-commissioned officers, are accommodated in the entresol of the building—often in large barrack-rooms, divided by curtains, some of the divisions having no access whatever to the external air. The atmosphere of these rooms is very close and foul. In the same part of the building are also the kitchens, laundries, shops, and several other offices. The atmosphere is in consequence unwholesome, and likely to communicate its impurities to the rooms above.

One or two of the non-commissioned officers' rooms at Portman Street, from darkness, damp, and want of ventilation, are absolutely unfit for human habitation. Those in the Wellington barracks are also bad. They are reached by a long narrow staircase; they are very small, badly ventilated, and, from being over the kitchen, they are close and unwholesome, the thermometer standing in them, in summer, sometimes at 80° F.

In Knightsbridge barracks the sanitary condition of the staff officers' quarters is little if at all better than that of the serjeants and privates. They are placed in a confined corner of the barrack-yard, over the infirmary stables and sick horse-boxes, the effluvia from which at times pervades them.

The laundries in all the barracks we have inspected in London are mere wash-houses. The apparatus in the Wellington barracks is the best in any of the metropolitan barracks, and, indeed, is very good, but the soldier is not allowed to use it. It is reserved for the use of the barrack department. The appliances for properly getting up linen are wanting in all ; none are provided with drying apparatus, a deficiency which without doubt frequently exposes the soldier to the risk of wearing damp linen.

We have since seen a very complete laundry and married soldiers' establishment at the Anglesea barracks, Portsea, with drying apparatus, wringing machine, and other conveniences.

In all the barracks the kitchen arrangements have been very imperfectly considered. The want of space and light, which is in kitchens synonymous with filth and neglect, the paucity of appliances for any but the roughest cooking, show that the meals of the soldier can be but mere sustenance, if, in their vapid sameness and moderate quantity, they are even that. Gas roasting-ovens have been erected in two or three of the kitchens.

Steam, smoke, blackness, filth, and disorder are the normal conditions of these places in some of the barracks we have visited.

There is no difficulty in erecting suitable apparatus for cooking so far varied as to include baking and roasting, as well as boiling, which would work well and cleanly in place of those sombre, clumsy constructions which seem to offer a premium for neglect and bad cooking.

All the barracks in the London district, except the Tower, are abundantly supplied with good water, either from the Government artesian well, or from the West Middlesex and other water companies.

The Tower is partly supplied by the Mint well, from which it receives 2,000 gallons per day, partly by Thames water, which is unfit for drinking.

We would advert here to an arrangement in the water supply of the Tower hospital, which has been remedied since our inspection, so far at least as the kitchen is concerned. In a small court behind the hospital were placed close together two water taps, one supplying foul Thames water, drawn opposite the Tower, though filtered; the other supplying water from the Mint artesian well. The former is absolutely unfit for use, and yet by a very easy mistake it might have been drawn for the use of the sick. Again, the only water tap in the hospital kitchen is supplied with the same Thames water, and there is no security that it may not be drawn for

cooking for the sick. This singular arrangement is the more unaccountable as the barrack kitchens are supplied solely by the artesian well water.

The large and widely-spread heaps of stable manure in the cavalry barracks are nuisances dangerous to health. We are of opinion that these accumulations should be daily removed from the cavalry barracks of the metropolis.

Having described generally the sanitary condition of these barracks, we now proceed to notice, shortly, the defects of individual barracks, and to point out the means for their removal.

## 1.—WELLINGTON BARRACKS.

These barracks stand in an enclosure occupying altogether 7a. 3r. 3p. in extent, and are constructed to contain, under the existing regulations, 1,530 non-commissioned officers and men ; the space per man varying from 435 to 564 cubic feet.

They consist of four blocks, A. B. C. and D., built at different periods, forming an irregular quadrangle, with interior yards, the ends of which form culs-de-sac. The external ventilation of these parts of the barrack is very defective. The privies, urinals, and ash-pits are placed in the centre of each court, so as to add to the impurity of the already stagnant air.

The principal building, named block "A.," is three stories high. The barrack-rooms in it are placed back to back, four rooms on each floor. The fire-places are in the middle of the wall, between each set of two rooms, and the windows, three in number in each room, are opposite the fire-place. Some of the rooms have large square openings, protected by sliding shutters, for the purpose of ventilation through the centre wall into the adjacent rooms ; the men complain of the discomfort occasioned by the noise through these openings. They are of no use for ventilation, and except when the windows are open, they merely allow of the interchange of the foul air between the two rooms.

In this block each room is provided with openings for ventilation in the ceiling, having valves, capable of being closed. There are also openings by means of air bricks near the level of the floor, which, however, are almost always stopped by the men, on account of draughts. And none of the ventilating openings are provided with means for breaking the current or diffusing the air.

The chimney breast is three feet or three feet six inches from the ground.

In "B." block, all the rooms have two windows at one end ; and two at the other, of smaller dimensions, opening into a closed corridor 9 feet broad. Each room has four ventilators, 10 inches square, near the floor, and four in the walls near the ceilings, communicating with flues running to the top of the building.

In "C." building, all the rooms are arranged similarly to those in "B." The rooms and corridors are ventilated by gratings in a hollow skirting, and air flues near the ceiling, carried into flues in the roof, terminating in a shaft at the top of the building, where ventilation is assisted, in hot weather, by gas burners. Air-bricks are provided between the rooms and the corridor, and the corridor is fitted with stoves and hot-water pipes, to enable the air in it to be warmed, the object being that warm air should pass into the rooms, and thence to the central shaft. These stoves and pipes have not been used.

In "D." building, the rooms extend from the back to the front, with two windows in each end. They have also ventilators similar to those in "B." building.

The following table shows the number of men accommodated in the rooms according to the existing barrack regulations, as contrasted with the number they will accommodate under the required space of 600 cubic feet per man :—

| Buildings. | Number of Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|---|
| A. | 12 | 192 | 156 | 36 | 16 | 13 |
| „ | 12 | 180 | 156 | 24 | 15 | 13 |
| „ | 12 | 168 | 144 | 24 | 14 | 12 |
| B. | 6 | 96 | 78 | 18 | 16 | 13 |
| „ | 6 | 90 | 78 | 12 | 15 | 13 |
| „ | 6 | 84 | 72 | 12 | 14 | 12 |
| C. | 8 | 128 | 104 | 24 | 16 | 13 |
| „ | 1 | 15 | 13 | 2 | 15 | 13 |
| „ | 8 | 112 | 96 | 16 | 14 | 12 |
| „ | 1 | 13 | 11 | 2 | 13 | 11 |
| „ | 1 | 20 | 17 | 3 | 20 | 17 |
| „ | 8 | 112 | 88 | 24 | 14 | 11 |
| „ | 1 | 13 | 11 | 2 | 13 | 11 |
| „ | 1 | 20 | 17 | 3 | 20 | 17 |
| D. | 1 | 21 | 17 | 4 | 21 | 17 |
| „ | 2 | 40 | 34 | 6 | 20 | 17 |
| „ | 2 | 36 | 30 | 6 | 18 | 15 |
| „ | 1 | 14 | 12 | 2 | 14 | 12 |
| — | 89 | 1,354 | 1,134 | 220 | — | — |

This table shows that while the existing regulation makes provision for 1,354 men, the barrack-rooms will only, at 600 cubic feet per man, accommodate 1,134 men, and hence that additional accommodation is required for 220 men ; showing an actual deficiency of 16 per cent. of accommodation.

The regulation accommodation, however, does not give a correct idea of the number of men in barracks; for the actual number of men in the occupied barrack-rooms is 1,447, which exceeds the regulation number by 93. To effect this an additional number of men is placed in 56 out of 89 rooms.

In 22 rooms there is one man in each above the regulation number.

In 36 rooms there are two men above the regulation number in each room.

In two rooms there is one man in each below the regulation number.

In two rooms there are two men below the regulation number.

The barrack-rooms, as we have shown, will only hold 1,134 men, if each man has the minimum space requisite for health, namely, 600 cubic feet ; and there are thus 1,447 men in the cubic space necessary for 1,134 men, and hence 313 men should be removed out of the barracks and accommodated elsewhere.

There are 12 soldiers' sleeping-rooms capable of containing, perhaps, 110 men in all, misappropriated, as follows :—

Two are used as orderly-rooms, one as a library, and nine rooms are occupied by regimental staff-serjeants, &c. No other available accommodation exists for any of these purposes.

The misappropriations should either be deducted permanently from the barrack space, or else they should be restored, and space for the library, orderlies' and staff-serjeants' rooms provided elsewhere. But, even if this latter course were taken, there would still be a deficit of sleeping space for 200 men. There is misappropriation of barrack-rooms also as tailors' and shoemakers' shops.

There is nominal accommodation for 20 serjeants per battalion, but many of the rooms, 11 feet by 9, are too small for a family. They are close and unwholesome, approached by a narrow staircase, and over the kitchen, the heat and smell from which is so great as to be intolerable in warm weather. Even in winter the thermometer in the rooms frequently stands at 70°. The families of married soldiers live out of barracks.

Gas is used for lighting throughout the building, but without ventilators.

There is no separate day-room.

School-rooms have been built expressly for adults and infants, but they are not sufficiently large.

There is a school-room for the men, in which the gas-lights are inconveniently placed. It has two fire-places, but fuel for one fire only is allowed.

There is a library and reading-room, to which those who subscribe are admitted, the books being furnished by the Government; but the space is obtained by misappropriation of a soldiers' barrack-room.

The ablution-rooms are placed on the basement story. In one of them two baths only are provided, although the room in which they are placed could conveniently hold 10; it is stated that 100 baths per day are taken. There are in the whole building five baths, two heated by steam, and three by hot water, supplied from an adjacent laundry. Two rooms are appropriated as soldiers' laundries; but there are no drying-rooms. The wives of non-commissioned officers only being allowed to live in the barracks, part of the soldiers' washing is consequently done outside.

There are four cook-houses, fitted with ordinary ovens, two for each battalion.

The cook-houses stand in rear of the barracks. They are narrow and lofty, and contain a row of coppers, arranged against the wall, and an oven for baking. The space is confined, and they are not light enough. In the same building are placed the non-commissioned officers' quarters, so much complained of.

There are six cleaning-rooms, all in the roofs of the buildings. When they are in use, the air of these rooms is charged with a cloud of fine pipe-clay dust, which is breathed by the men, and is very likely to be injurious to health. Any one who has had an opportunity of witnessing this method of cleaning the white undress jackets of the men cannot fail to be struck with its injurious tendency, and with the expediency of providing undress jackets of some other colour.

Between the buildings there are two covered ways, used for drill.

The tailors' and shoemakers' shops are situated in the basement, but are so dark as to lead to the misappropriation of the soldiers' sleeping-rooms for workshops.

The water supply is of excellent quality, abundant and uninterrupted, from the Government artesian well.

The present system of drainage was laid down in 1851, and consists of glazed pipes properly trapped, which discharge themselves into the main sewer in York street.

In the confined court-yards behind the barracks, surrounded by the non-commissioned officers' quarters and the barrack-rooms, stand the ash-pits, privies, and urinals. The ash-pits are large, uncovered, and generally full of refuse. The privies and urinals are under one roof; the privies are dark and offensive; the back wall from the seats to the water is in a continually filthy state; they have no divisions, and the seat is what is customary in old barracks, consisting simply of cross bars at intervals, as if a ladder had been laid over the trough.

The guard-room is too small and confined for nine men, and the cells, the privy, and the urinal attached, are all almost under the same roof with it.

It is necessary to advert here to the practice of using large quantities of sand in cleansing these barracks. As much as four tons a week have been so used in the Wellington barracks. It fills the staircases and barrack-rooms with fine sand dust, which is inhaled by the men, and is deposited over the whole building. The inhalation of sand dust is a predisposing cause of chest diseases; and without attributing to it unnecessary importance, we are of opinion that sand should cease to be used for cleansing, as has been the case in the barracks of the line.

*The following requirements are necessary for securing the healthy condition of Wellington Barracks:—*

1. Misappropriated rooms to be restored to their use as barrack-rooms, and suitable buildings erected for library, offices, day-rooms, workshops, &c.; or otherwise the misappropriations to be confirmed, and the space deducted from the "available accommodation."

2. Numbers in every room to be reduced, so as to increase the cubical space to 600 feet per man.

3. Every barrack-room in which there are no air shafts to be ventilated by an air shaft, carried up from the ceiling of the room, above the roof of the barrack, and fresh air to be admitted to every barrack-room by inlets and perforated zinc cornices at the top of the room. This method of admission to be substituted for orifices in or near the skirting boards in all the rooms. These latter orifices to be permanently closed.

4. Special accommodation to be provided for library and for day-rooms.

5. Windows in lavatories to be enlarged, and the number of baths to be increased as far as the space will allow.

6. Wash-houses to be provided with drying apparatus.

7. Married non-commissioned officers' quarters to be ventilated by inlets, and means to be adopted for thoroughly ventilating the kitchens under these quarters.

8. Reconstruction of privies and urinals throughout, with proper divisions and doors, and increased light by means of glass tiles in the roof.

9. Daily removal of barrack refuse to be provided for.

10. Kitchens to be provided with roasting ovens for varying the cooking of rations, and with means for supplying boiling water for tea.

11. The use of sand for cleaning to be discontinued.

## 2.—ST. GEORGE'S BARRACK.

These barracks are surrounded on all sides by lofty buildings, which prevent that free circulation of the air, so necessary for health, when large bodies of men are congregated together.

They are situated behind the National Gallery. They occupy with the barrack-yard an area of 1a. 2r. 3p., and are constructed to contain 540 non-commissioned officers and men. The front faces the east, and is from 200 to 250 feet from the nearest buildings; the back is not much more than 20 feet from the houses in rear, and the interval is partly occupied by offices.

The barracks are three stories high; the rooms run from front to back, and have windows on both sides,—an arrangement which affords the best barrack-room ventilation, so far as it can be obtained by open windows alone. Two rooms open upon the central landing and staircase on each floor; the fire-places are in the centre of the side opposite the door.

The cubic space per men ranges from 506 to 531 feet. The rooms used as barrack-rooms are 31 in number, and contain from 14 to 16 men each.

Twenty serjeants' rooms have been constructed on the landings of the staircases at the back, but are far too small, being only 11 feet by 9. There is no accommodation for married soldiers.

The barrack-rooms have almost all been provided with a ventilating shaft, carried up in the chimney stack.

There are also, in most rooms, ventilators in the ceiling, connected with openings in the wall outside; these can be closed by valves, which, being under the control of the men, are generally shut at night.

There is no day-room.

The barrack is lit by gas.

As St. George's barrack contains none of the re-

quirements for the head-quarters of a regiment, or for schools, there is considerable misappropriation of rooms for such purposes.

One barrack-room is taken for a school-room, for which it is much too small. Another barrack-room has been taken for a library, and others are occupied by non-commissioned officers.

There is one ablution-room in the basement, and another in the rear of the buildings, with one bath. The ablution-rooms are well supplied with water, but are dark and damp, and are without wooden gratings for the men to stand on. The women's wash-house is dark and ill-ventilated.

There are two kitchens in the basement, one fitted with a gas apparatus for roasting, and one with boilers only. The roasting apparatus does not appear to give satisfaction.

The laundry is in rear of the barracks, in a room which measures 20 × 15 × 16 feet high.

There is one cleaning-room in the basement, from which the pipe-clay dust makes its way to the top of the building, entering the windows as it ascends—a sufficient proof of the extent to which the use of pipe-clay for cleaning may injure the purity of the atmosphere.

There is no covered shed for drill.

There is no tailor's shop. A room in the rear is marked for a shoemaker's shop, but not used, on account of being too dark.

The water supply is excellent and abundant, and is derived from the Government artesian wells.

The guard-room is of a good size; but it is dark and wants ventilation.

The privies and urinals are in rear, close under the windows. The ash-pit is also in rear; it is large and uncovered.

There is by no means sufficient space for circulation of air between the privies, urinal, ash-pit, and the barracks.

The sewerage is sufficient, and does not pass under the buildings. The drains are trapped.

The latrines are flushed out into the sewers and afterwards filled with water every morning, and oftener, if required. But they have no divisions or doors.

The urinals are without water and offensive.

The following is the accommodation in occupied rooms in St. George's barracks :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 21 | 336 | 294 | 42 | 16 | 14 |
| 10 | 140 | 120 | 20 | 14 | 12 |
| 31 | 476 | 414 | 62 | — | — |

The number of men on the schedule of St. George's barrack is 540.

There are seven sleeping-rooms turned to other uses.

The number of men which ought to be placed, according to the existing regulations, in the occupied rooms is 476.

The actual number in these rooms, 517.

The number of men which the occupied sleeping-rooms ought to contain, at 600 cubic feet per bed, is 414.

The probable number the barrack could contain at 600 cubic feet, if all the sleeping-rooms were occupied, is 450, leaving a deficiency of accommodation in the occupied rooms for 62 men.

It hence follows—

Either that the misappropriated rooms should be permanently deducted from the schedule, and the number of men on the schedule reduced from 540 to 414.

Or, that the misappropriated rooms should be given up for sleeping-rooms, and the number in the schedule reduced from 540 to 450.

In either case 600 cubic feet of space should be given to every bed.

Captain White remarks, that all the requirements for the head-quarters of a regiment are deficient in this barrack, and all have consequently been taken from the sleeping accommodation intended for the men.

*The following are the Sanitary Improvements required for St. George's Barracks:—*

1. The estimated "available accommodation" to be reduced, so as to give the space required at the rate of 600 cubic feet per man. Mal-appropriations to be discontinued, and additional buildings to be provided for school-rooms, day-rooms, tailor's shop, &c., in which this barrack is at present deficient.
2. Better accommodation for non-commissioned officers to be provided.
3. Ventilation of rooms to be improved by perforated zinc inlets in the cornices of the rooms.
4. The laundry to be better lighted and ventilated, and to be provided with suitable means for drying linen.
5. Kitchens to be provided with roasting ovens.
6. Seats of latrines to be properly divided: to have doors, and to be better lighted by glass tiles in the roof. Urinals to be supplied with water.
7. Improvement of ablution-rooms by additional light, the use of wooden gratings to stand on, and an increased supply of baths.
8. Ashes and dust to be removed daily.
9. A covered shed for drill to be provided.
10. Guard-room to be better lighted, and to be ventilated through the roof.
11. Use of sand for cleaning floors to be discontinued.

## 3.—WATERLOO BARRACKS, TOWER.

These barracks stand within the precincts of the Tower; they were built after the fire; they are calculated to contain 766 non-commissioned officers and men under the existing regulation, with a cubic space per man varying from 432 to 535 feet.

The accommodation is allotted as follows :—

| Number of Rooms. | Present Regulation Number of Men. | Number of Men at 600 Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 2 | 34 | 30 | 4 | 17 | 15 |
| 11 | 198 | 165 | 33 | 18 | 15 |
| 2 | 34 | 30 | 4 | 17 | 15 |
| 12 | 216 | 180 | 36 | 18 | 15 |
| 2 | 34 | 26 | 8 | 17 | 13 |
| 12 | 216 | 156 | 60 | 18 | 13 |
| 41 | 732 | 587 | 145 | — | — |

The rooms now occupied as sleeping-rooms will only accommodate with safety 587 men, instead of 732, their present number.

It is necessary, therefore, to reduce the number on the schedule to 587, and to apportion the accommodation at the rate of 600 cubic feet per man, which will necessitate either the removal of 145 men from the barracks, or providing additional barrack-room for that number at the same ratio of cubic space.

The barrack-rooms are lofty, but they exhibit an obvious error in construction in being built back to back, and being ventilated into each other by openings in the partition walls. In the lower, and indeed in all the rooms, the bottom of the windows is above the level of the eye, which makes the rooms far from cheerful. Some rooms are very dark. The fire-

places are on the sides, opposite the doors. Ventilators are provided for each room at two feet above the floor, close upon the men's beds, and as a necessary consequence they are closed up at night, when fresh air is most required. With a few exceptions there are 18 men in each room, and there is no misappropriation of rooms. The ventilation of these barrack-rooms is most imperfect.

The non-commissioned officers have 34 sleeping-rooms, which are small and inconvenient, being placed in the projecting ornamental towers.

There is no special accommodation for the wives and families of non-commissioned officers and soldiers.

The serjeant's mess-room is very dark and ill-ventilated; there is a blank window in the architecture, not now pierced, which might be rendered available for increasing the light.

The school-room at the time of our inspection was badly ventilated. It is small for the number of men. The ventilation has, however, been since improved by a trifling alteration.

The soldiers' library is above the cook-house, and consequently very hot and close in summer. The whole building is lit by gas, but without ventilators over the burners. There is no day room.

The guards' ablution-rooms are good; there are two baths. Additional baths are required.

The artillery ablution-room is dark, and badly ventilated, and has no bath.

There is one laundry, supplied with water inside.

The cook-houses are all provided with coppers, but not all with ovens. They require ventilation.

The privies and urinals are in a circular and very spacious room; the privies are of the usual form, without divisions, and the urinals are very offensive; but the drainage is sufficient, and does not pass under the buildings; the drains are trapped, and the latrines are flushed daily.

There is only one privy for all the women attached to the troops in the Tower.

There are two cleaning-rooms under the roof of the barracks.

There is no shed for drill.

There is a tailor's and a shoemaker's shop.

The guard room is not well ventilated; and the ventilation of the lock-up room is most defective.

The *hospital* belonging to these barracks has been formed out of dwelling-houses, which have been adapted for the purpose. The wards consist of rooms, thrown together; they are small, low, confined, and insufficiently ventilated. The kitchen, in the basement, is badly ventilated. The urinals at the back are offensive, as no water is turned through them.

The Tower barracks and hospital are supplied with water from two sources:—

1st. From the well at the Mint, which gives 2,000 gallons daily.

2nd. From the Thames.

The water from the Thames is unfiltered, but is pumped into large tanks, where it can settle when not drawn off too rapidly.

We thought it right to submit the water from these two sources to Mr. Witt for analysis.

The water from the Mint is not very good, but the Thames water is entirely unfit for use, especially in warm weather, when it rapidly begins to emit a smell from the decomposition of organic matter.

The latter water at the time of our inspection was the only water supplied to the hospital kitchen, but this defect has been since remedied.

Quarters for schoolmaster and schoolmistress are wanting, also an infant school-room.

*The following are the Requirements for Health:—*

1. All the barrack-rooms to be ventilated by shafts, with inlets for fresh air near the ceiling. Present inlets to be closed.

2. Artillery ablution-room to be better lighted, and to be provided with wooden gratings and a bath.

3. Guards' bath accommodation to be increased.

4. Laundry to be provided with drying closet.

5. Non-commissioned officers' quarters to be ventilated.

6. Increased supply of water from the Mint, or from some water company, and the use of Thames water to be discontinued.

7. Quarters for schoolmaster and schoolmistress to be provided.

8. Better ventilation for kitchen, and additional ventilation for school-room and library through the roof.

9. Ashes and refuse to be removed daily.

10. Numbers of men in barracks to be reduced so as to allow 600 cubic feet per man.

11. Windows of barrack-rooms to be lowered by addition of another tier of mullions, and an additional window to be pierced in the officers' mess-room.

12. Wards of *hospital* to be ventilated by shafts through the ceiling, and proper inlets for air close to the ceiling of the room. It would be very desirable that a better hospital should be provided.

13. Sand for cleaning floors to be discontinued.

14. Guard-room and lock-up to be ventilated by suitable openings near the ceiling.

15. Day-room to be provided.

16. Privies to be ventilated and divisions and doors to be provided. Urinals to be ventilated and supplied with water.

## 4.—ST. JOHN'S WOOD BARRACKS.

These barracks stand in a comparatively open position in Ordnance Road, St. John's Wood, and are within an enclosure of 4A. 2R. 19P. in area.

They are placed along the southern end of the inclosure, and a riding school and quarters for two officers occupy a portion of its northern end.

The barracks were originally intended for cavalry, but no stables were ever built, and the riding school, which is the finest and largest in London, remains as the only record of their original destination.

The barrack is two stories high. It consists of five separate blocks, three appropriated to the men, and two, at the ends, to non-commissioned officers, and to the kitchen. Two rooms open out of each landing or staircase; the fire-place is opposite the door, and the windows open into the barrack-yard. As the barracks are placed close to the boundary wall, no openings can, as we are informed, be made through the walls at the rear of the barrack-rooms, and they cannot, therefore, have any thorough draught for effective ventilation. The dead wall referred to runs along the whole of one side of the range of buildings. The windows face the north on one side only, and the rooms exhibit sanitary defects incident to back-to-back cottages, from the atmosphere in them being always more or less stagnant.

The following table shows the accommodation, in contrast with what it would be at 600 cubic feet per man:—

| Number of Barrack Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 11 | 220 | 121 | 99 | 20 | 11 |

The barrack was unoccupied when inspected by us.

There is no misappropriation of barrack-rooms. All the rooms are allotted according to the schedule.

Ventilation is partially provided for by openings seven inches square, placed in each barrack-room, communicating with air bricks in the external walls. But the condition of the atmosphere, even when the

rooms were empty, showed that the ventilation is very defective.

In the serjeants' rooms there is no provision for ventilation. The guard-room is not ventilated.

The building is lighted by gas, without any provision for removing the products of combustion.

There is a library. The school-room and an exercise or day-room for the men are placed in a space partitioned off from the riding-school.

The lavatory, which is in a detached building, is supplied with water from a slate cistern.

There is a bath supplied with a boiler, and a washhouse, fitted with two coppers. But there are no means of drying linen in moist weather.

There is no accommodation for married privates.

The kitchen is supplied with Deane and Dray's gas-stove for baking, and six ordinary boilers. The kitchen is too close to the latrines, and suffers much from the effluvia arising from them.

The cleaning-room is a lean-to building, in continuation of the washhouse. The riding-school is used for drill in wet weather. There is an armourer's shop, but no other means of affording employment to the men.

The water supply is derived from the West Middlesex Water Company.

All the drains are trapped, but said to be frequently out of order. The drains are principally stoneware pipes, jointed in cement. None pass under the buildings.

The latrines are placed in brick and slate covered sheds: they have no divisions between the seats, and require light and ventilation. They are flushed by the ordinary flushing apparatus, and are not constructed on the best principles, for they give rise to nuisance.

There is no day-room.

The refuse and dust are allowed to accumulate before removal, instead of being taken away at once.

*The following are the Sanitary Improvements required for this Barrack:—*

1. Latrines to be ventilated, improved, better lighted, and provided with divisions and doors.
2. Quarters of non-commissioned officers to be ventilated.
3. All the barrack-rooms to be ventilated by shafts in the ceilings, carried above the roof, and by perforated zinc ventilators to admit air near the ceiling.
4. A drying-stove to the washhouse.
5. Reduction of the number of men in each room, so as to afford 600 cubic feet per man.
6. Refuse and dust to be removed daily.
7. Bath accommodation to be increased as far as the space will allow.

## 5.—PORTMAN STREET BARRACKS.

These barracks are in a very confined situation, between Portman Square and Oxford Street. They do not belong to Government, but are held on a lease. The term has expired for some time, but they have been taken on for short periods on several occasions.

The present term would expire in September of this year, but we have been given to understand that they have been taken for a further period of one year.

The area occupied by the inclosure in which the barracks are situated is about 1A. 0R. 13P., and the buildings are intended to hold 539 men, including non-commissioned officers, with a cubic space of 374 feet per man.

They consist of very old two-story brick structures, forming an oblong quadrangle; one end through which is the main entrance by archway, contains the officers' quarters; at the opposite end is the riding-school, now used as kitchen and mess-room; right and left is the accommodation for the men, consisting of 27 rooms, containing (according to schedule) 21 men each.

The following is the allotment of the accommodation:—

| Rooms. | Regulation Accommodation, 21 Men in each Room. | Number of Men capable of being accommodated at 600 Cubic Feet each. | Number of Men for whom there is Deficiency of Accommodation. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 23 | 483 | 276 | 207 | 21 | 12 |

Leaving a deficit of regulation accommodation for 207 men. The actual number of men in barrack is, however, under the regulation number. But there is, nevertheless, great overcrowding.

| | |
|---|---|
| Of the 22 occupied rooms, 20 have 20 men in each, giving accommodation for - - - | 400 men. |
| One room has - - - | 12 „ |
| One room has - - - | 10 „ |
| The total present inmates in the barrack-rooms are - - | 422 men. |
| At 600 cubic feet of space, each room would hold 12 men, or in all - - - - | 264 „ |
| There is a deficit, therefore, in the occupied rooms of accommodation for - - - | 158 men. |

But one room has two fewer than it would accommodate (10 instead of 12), and one room is unoccupied; the actual deficit is therefore 154 sleeping places, or 36½ per cent. of the regulation space.

If this barrack is to be used, it will be necessary to reduce the number on the schedule of occupied rooms from 483 to 276. Also at once to remove 154 men out of it, and to allot the space among the remainder in the proportion of 600 cubic feet for each.

The range of barrack-rooms on the south side of the square is placed with its back close against the very narrow back premises of the houses in Oxford Street; the northern range, on the opposite side of the parade ground, is a very short distance within the limits of the inclosure, and in the long narrow yard which intervenes are placed canteen and barrack-stores, privies, stables, ablution-house, laundry, and ash-pit; the whole space being narrow and confined, and likely in hot weather to be noisome, if not dangerous.

The entire establishment is in very bad repair, the flooring worn out, and the walls in parts projecting several inches beyond the foundation. The surface drainage of the court was very defective at the time of our visit, and allowed water and filth to lie on the surface.

The barracks are two stories high; the rooms run through from front to back; two rooms on each floor open upon the landing or staircase. In the upper rooms, the walls are so low, that the ceiling has been carried up into the slope of the roof, taking the rafters into the room, and the windows being very low also, great stagnation of air takes place in the roof space above them.

The beds are placed close together, and seven feet from foot to foot.

The rooms have two large windows each, one at each end. On the north side the light and ventilation are tolerably good, considering the position and construction of the buildings; on the south, both are deficient, from the rear windows being close upon houses.

Ventilating shafts and ventilators are provided in the ceilings and floors. The ventilators on the floor, in the lower rooms open at the level of the yard, close to the filthy gutters.

The whole of the buildings are in so bad a state of repair, that they may be said to be pervious to air. And there is hence a certain amount of ventilation independent of the windows, and of ventilating openings and shafts.

The barrack-rooms are misappropriated, one to a school room, and one to a library.

The ablution-room is in a ricketty shed in the rear of the northern range of barracks, but there is no bath, and it only contains 22 basins for 422 men.

The privies are near the ablution-room. They are made in ordinary form in the London barracks, without divisions, but they have trap ventilation at the back, over the seat. The sewers and drains are trapped.

The cooking is carried on in this barrack in a large room, formerly a riding-school, where the men also sleep, and which they occupy as a day-room. There are three sets of boilers for cooking, but there are no places for roasting or baking.

Four rooms are appropriated for the serjeants' mess.

The library and school-room are badly lighted and ventilated, and close to the ash-pit.

There is no laundry; nor accommodation for them.

The prison cells are unventilated and unwholesome.

Portman barracks are in a very dilapidated state, and are hardly fit for occupation. They could only be improved by a large outlay of money, and as they are to be evacuated, the only recommendation we were to offer is that this may be done as soon as possible.

## 6.—MAGAZINE BARRACK, HYDE PARK.

This is a small barrack for 83 non-commissioned officers and men, situated on high ground, in the centre of Hyde Park.

The site and isolated position of this barrack, and the structure of the rooms, are conducive to health.

The barrack contains two large and three small barrack-rooms, of which two are appropriated to non-commissioned officers. The larger rooms hold 29 men each, and have a fire-place at each end, and windows on both sides. Each room has ventilating openings in the ceiling, which appear to be habitually closed.

The accommodation is as follows :—

| Rooms. | Number of Men according to Regulation. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Men's Sleeping Spaces in Barrack Rooms. | Actual Number of Men in Barrack. |
|---|---|---|---|---|
| 1st | 14 | 7 | 7 | School. |
| 2nd | 29 | 19 | 10 | 22 |
| 3rd | 5 | 3 | 2 | 1 |
| 4th | 26 | 17 | 9 | 20 |
| 5th | 5 | 3 | 2 | 1 |
| 5 | 79 | 49 | 30 | 44 |

In rooms 2nd and 5th, which are the soldiers' rooms at present occupied, the regulation number of men is 55, while, if each soldier had 600 cubic feet, the number would be 36, showing a deficiency of 34½ per cent. in the accommodation. The actual number of men, however, in these two rooms is 42, or six more than there ought to be.

One room is set apart for a school-room, and ought to be deducted from the schedule.

The rooms are light; they have windows on opposite sides, and also inlets for air.

The ash-pit is badly placed, and too close to the barrack.

The ablution-room is good, but small, and has no bath.

The soil from the privy is flushed into the Serpentine. There are neither doors nor division of seats.

The water supply is derived from a well close to the privies.

The kitchen is very small; it has four boilers, but no means of baking.

There is no laundry, the men's ablution-room being used by the women for that purpose. The cleaning shed is in the rear.

The privy of the guard-room is in a very bad condition.

*The following are the Improvements required for this Barrack:—*

1. If all the rooms are to be used, and if it be necessary to accommodate 79 men in this barrack, additional barrack accommodation will have to be provided for 30 men. But if the school-room is to be continued, the space ought to be deducted from the available accommodation, and the number of men on the schedule reduced from 79 to 42.
2. A wash-house, with drying-stove, to be provided.
3. Coal-store and ash-pit to be removed farther from barrack-rooms.
4. Cleaning-shed to be boarded.
5. Privy to have divisions between the seats, and to be provided with water-trough and flushing apparatus.
6. New privy to be constructed for guard-room.
7. Kitchen to have means of roasting and baking meat.
8. Barrack-rooms to be ventilated by shafts carried through the ceiling to above the roof.

## 7.—KNIGHTSBRIDGE CAVALRY BARRACK.

These barracks occupy an area of 3A. 2R. 35P., being built on a strip of land about 1,142 feet long, and varying from 202 to 92 feet in breadth, bounded by the Knightsbridge road on one side, and by Hyde Park on the other.

They are separated from the Knightsbridge road by a high wall, and the barrack buildings form the boundary on the side of the park. The court-yard is confined, and there is very little circulation of air.

The men's rooms are placed over the stables. Each room opens into a corridor on the side towards the court-yard, with windows looking into the yard, opposite the room doors. On one side, the dung-heap is under the windows, and was very offensive at the time we visited the barrack. The rooms are large but low.

The accommodation, according to the schedule, is for 536 non-commissioned officers and men. The actual number in the barrack is 385.

The space is allotted as follows :—

| Wings. | Rooms. | Number of Men to be accommodated according to existing Regulation. | Number of Men who can be accommodated at 600 Cubic Feet each. | Number of Men for whom there is Deficiency of Accommodation. | Actual Number of Men in Barrack Rooms. |
|---|---|---|---|---|---|
| North 2nd floor | 1 | 11 | 8 | 3 | — |
| „ | 1 | 13 | 10 | 3 | 12 |
| „ | 9 | 180 | 151 | 29 | 155 |
| South 2nd floor | 1 | 13 | 10 | 3 | 1 |
| „ | 1 | 11 | 8 | 3 | 1 |
| „ | 9 | 180 | 160 | 20 | 155 |
| „ | 1 | 13 | 11 | 2 | 10 |
| „ | 1 | 12 | 10 | 2 | 1 |
| „ | 1 | 12 | 8 | 4 | 1 |
| North 1st floor | 1 | 19 | 15 | 4 | 10 |
| „ | 12 | 1 | 3 | — | 1 |
| Married - - | 10 | 1 | 3 | — | 1 |
| East 1st floor - | 1 | 19 | 15 | 4 | — |
| „ 2nd floor - | 1 | 20 | 16 | 4 | 6 |
| Total - - | 50 | 505 | 428 | 81 | 354 |

Of the 50 rooms in this barrack, 26 are appropriated to one man each, and are set apart chiefly for married people and their families.

Excluding those rooms in which there is one man only in each, according to the regulation, and two troop-rooms unoccupied, the regulation number of men in the 22 remaining rooms is 425; but the number these rooms would contain, at 600 cubic feet per man, is 363. The regulation number, therefore, exceeds the available space by 62 men.

The actual number of men in these 22 rooms is 348, which is 15 less than they would hold.

The men are unequally distributed, thus :—

1st.—In every room the actual number is below the existing regulation.

2nd.—In one room there are 12 men where the existing regulation gives 13, and where only 10 should be, at 600 cubic feet each.

3rd.—In 9 rooms there are 155 men, where 151 ought to be, at 600 cubic feet each.

4th.—In 9 rooms there are 155, where 160 might be, at 600 cubic feet each.

5th.—In 1 room there are 10, where 11 might be.

6th.—In 1 room there are 10, where 15 might be.

7th.—In 1 room there are 6, where 16 might be.

In the occupied rooms, then, some re-arrangement might be advantageously made; but, with one single exception, no room contains more than the proper number.

One room, with accommodation for 11 men by regulation, but actually for 8, is unoccupied.

One room, with regulation accommodation for 13, but actually for 10, has 1 occupant.

One room for 11, but actually for 10, has 1 occupant.

Two rooms for 24, but actually for 18, have 1 occupant each.

The additional available space in the barrack (exclusive of 22 rooms set apart for 1 person each, by regulation) would thus accommodate, according to regulation, 59 men, but the cubic space would hold only 46 men.

If we deduct from this the 4 occupants of these rooms, it will leave available space for 42 men, which, added to 363 men (the number that can be accommodated at 600 cubic feet for each) will give an available accommodation for 405 men. The actual number in barracks is 352.

Hence, according to the regulation proposed by the Royal Commission of 600 cubic feet per man, the troop-rooms would hold 53 men more than the present number.

Deducting the 22 married men from the total regulation number 536, the troop-rooms, if all occupied, ought to hold 514 men, according to regulation; but at 600 cubic feet they would hold only 405, showing a deficiency of accommodation for 109 men. It will be necessary, therefore, to reduce the regulation number to $405 + 22 = 427$ in the barrack, and allot 600 cubic feet per man room by room.

The ventilation of the barrack-rooms is effected by openings under the windows, and by ventilating openings in the ceiling into the space under the roof; also by windows in the partition separating the rooms, an arrangement which is much complained of.

The non-commissioned officers and married privates occupy some of the rooms, with spaces partitioned off for four families in each room; many of these partitioned spaces are without openings to the external air, and are close and unwholesome.

The building is lit partly by gas and partly by candles.

There are a school-room and library, both of tolerable size. There is no day-room.

There are two ablution-rooms, with slate benches, and a good supply of water, but they are damp and ill-ventilated, and are not provided with baths.

Two rooms are appropriated as a laundry, with coppers and an open fire-place. A proper drying-stove is much required.

There are four kitchens, which have neither ovens nor any means of cooking except boiling.

There are two cleaning rooms.

All the above offices are situated on the entresol, which is low-pitched, close, and unwholesome.

There is a tailor's shop, very close and unventilated. Also a shoemaker's and saddler's shop, and a farrier's and shoeing shed.

8,000 gallons of water are supplied daily by the Chelsea Water Company. Up to 1849 this barrack was supplied from the Serpentine.

Barrel drains run under the whole extent of the barrack-yard, and under part of the building, to the main sewer in the road adjoining. All are trapped.

The latrines are provided with Salter's self-acting apparatus, which, when we inspected the barrack, was out of order. They are connected with the main sewer by drains. They are dark and offensive, and without separation of seats.

The cells for prisoners are damp; and the ventilation is obstructed by proximity to the wall of the barrack.

The guard-room is large but not well ventilated, and dark.

There are four urinals in the corners of the inner quadrangle; they are without water.

The hospital of this barrack is very badly placed. It is only nine feet from the barrack wall, in front, and 12 feet from the buildings in the rear. The wards have no thorough ventilation across them, although there are ventilators in the ceilings. The store-rooms are dark and damp. There are no baths attached to the wards.

There are three wards on the first floor, one spacious and good. There are water-closets between the wards.

The dispensary, consulting-room, and store-rooms on the ground floor are damp and dark. The packs and bedding are in the same store.

The ash-pit is in front of the hospital, close under the windows, and uncovered.

The whole of this barrack is saturated with a smell of the stables, which are separated from the living-rooms by the flooring, and a lath and plaster ceiling only. As we have already stated, the dung-heap is, in one place, under the windows of the men's rooms, and very offensive.

The staff officers' quarters, which are over the infirmary, stables, and boxes for sick horses, are much complained of.

*The following are the Sanitary Improvements required :—*

1. Ablution-rooms to be ventilated, wooden gratings to be laid down for the men to stand on. Baths to be provided.

2. All the rooms of non-commissioned officers and married privates, and all barrack-rooms to be ventilated by shafts carried up from the ceiling of each room above the roof, and air to be supplied by air-bricks and perforated cornices close to the ceiling of each room. Similar ventilation in the tailors' and other shops to be provided.

3. Means of roasting and baking to be supplied to the kitchens.

4. The stables to be thoroughly ventilated by shafts carried directly above the roof.

5. The stable doors opening into the passages at the foot of the staircases to be built up, and new doors to be opened into the court-yard.

6. Separation of seats in latrines.

7. Additional ventilation of cells for prisoners.

8. Horse infirmary to be removed from under the quarters of staff officers, or staff officers to be accommodated elsewhere.

9. Arrangements to be made for the daily removal of stable manure and barrack refuse.

10. Re-arrangement of men in each room, so as to give 600 cubic feet per man.

11. If this barrack is to continue in use, it will be necessary to provide a new hospital upon a proper plan on a suitable site.

## 8.—REGENT'S PARK BARRACK.

These barracks stand in an open situation, on high ground, between Albany Street Regent's Park, and the Regent's Canal. They occupy, with their enclosure, an area of about 8A. 1R. 7P.

The hospital is within the enclosure, and a school and a chapel are in course of erection.

The barrack-rooms are over the stables; they open out of a central passage. The ventilation, such as it is, is effected by perforated openings in the ceilings, and gratings in the skirtings of rooms. But it is not sufficient.

The passage between the rooms is badly ventilated.

The barrack is lighted by gas.

There is in this barrack accommodation, according to the schedule, for 397 men, including non-commissioned officers.

There are 30 troop-rooms, each accommodating 10 men under the existing regulation, or in all 300 men. There is 1 troop-room for 13 men; 1 for 16; 1 for 14.

The entire number of rooms ought, according to regulation, to accommodate 343 men. This number would have from 640 to 722 cubic feet per man.

300 men in these rooms would have by present regulation 640 cubic feet each.

At 600 cubic feet each, the rooms would accommodate 20 men more than the present practice requires, that is, they would hold 363 men instead of 397, the number on the schedule.

The actual occupants of the troop-rooms are 282 men.

No re-allotment of space or reduction of present numbers is necessary. But the number on the schedule should be reduced from 397 to 363, and the space divided in the ratio of 600 cubic feet per man.

The non-commissioned officers' rooms near the street require additional ventilation, and the passage leading to them is dark and badly ventilated, from the absence of windows towards the street. Windows can be so placed as to light these passages, without enabling the men to look out from them to the annoyance of the inhabitants of the opposite houses. This necessary improvement should be carried out.

There are three ablution-rooms, with one boiler and bath. Of these ablution-rooms one is good, the others damp and narrow. The water supply is not sufficient to allow the men to have baths, and even if it were, the number of baths is insufficient.

The cook-houses only provide for boiling the rations, and are unprovided with ovens.

There is a laundry, with three coppers, but it is not complete in other conveniences. It has no means of drying linen.

There is no special accommodation for married soldiers, but only for married non-commissioned officers.

There are five cleaning-rooms, a farrier's shop, and forge, and a tailor's and saddler's shops, the latter of which are very badly ventilated.

The drainage is in good condition; the drains are constructed partly of brick and partly of earthenware pipes, and are all trapped. One drain passes under the building, several feet below the foundation.

The latrines are provided with Salter's self-flushing apparatus, but are without divisions or seats.

The ash-pits and manure heaps, when we saw them, were full of refuse, uncovered and offensive.

The hospital of this barrack is commodious, and adapted for its requirements as a regimental hospital. It is ventilated from the ceilings.

*The following Sanitary Improvements are required:—*

1. All the barrack-rooms and shops to be ventilated by shafts from the ceiling rising above the roof, and with air-bricks and perforated cornices near the ceiling, on the plan recommended for the other barracks. Windows to be opened so as to light and ventilate the long passages on the side next Albion Street.

2. Division of seats, and doors to be placed in the latrines.

3. Stable manure receptacle to be raised and paved, and arrangements to be made for the daily removal of the manure and barrack refuse.

4. Parade ground to be drained.

5. Accommodation on the schedule to be reduced from 397 to 363 men, and 600 cubic feet of space to be allotted for every man.

6. Bath accommodation and ablution-rooms to be enlarged and improved. Water supply to be increased.

7. Kitchen to be provided with means of baking and roasting meat.

8. Laundry to be provided with drying stove.

9. Married soldiers' quarters to be provided.

## 9.—OLD CAVALRY BARRACK, KENSINGTON.

This consists of one long room for 44 men, with serjeants' and officers' quarters. The men's room is over the stable.

The whole is in a very old and bad state. We were informed that it is to be pulled down, which is the best thing to be done with it, as it is not fit for habitation.

## 10.—KENSINGTON INFANTRY BARRACKS (OLD).

These are old barracks for 80 men, placed at the back of Kensington Palace.

The rooms are low pitched, and badly ventilated.

The staircases are of wood, narrow, and circuitous.

As this barrack is to be abandoned, further remark is unnecessary.

## 11.—KENSINGTON NEW BARRACKS FOR CAVALRY AND INFANTRY.

These barracks have just been completed; they are intended to contain about 200 infantry and 60 cavalry. They cover with their enclosure an area of 1A. 3R. 2P.

The infantry barracks are three stories high, and the cavalry two.

They consist of two main buildings, running north and south, of which the eastern one is appropriated to the infantry, and western one to the cavalry.

The infantry barracks have rooms on both floors; in the cavalry barracks the men's rooms are over the stables, an arrangement to which we have already objected, although, in this instance, additional precautions as to ventilation and for preventing the passage of effluvia into the men's rooms have been adopted.

The non-commissioned officers' quarters are at the ends of the buildings.

The men's rooms open out of a corridor, the windows are opposite the door, and the fire-places in some cases between the windows, and in some cases in the side wall. These rooms have windows to the outer air only on one side.

The rooms are lofty; they have ventilating openings on a level with the floor, which will to a certainty be closed by the men, and also openings in the ceiling; these latter are connected with wooden flues, which all unite, and are carried up into one shaft, passed through the roof.

The window space throughout the building is too small, but the windows giving a borrowed light from the corridor can be enlarged.

The non-commissioned officers' rooms are altogether deficient in ventilation.

There is no accommodation in the cavalry barracks for married non-commissioned officers, or privates whose wives are "allowed."

There is neither laundry, school-room, nor non-commissioned officers' mess room. The staircases

and floors of corridors are of wood instead of stone, and the window space throughout the building is much too small.

In the infantry barrack the ablution-rooms are in the basement, and are objectionably dark ; and a bath is to be provided, which will still further diminish the quantity of light. There should be two baths for this barrack. The cook-house is also in the basement, an arrangement which should always be avoided wherever practicable, on account of the damp and fumes which are apt to pass into the men's rooms above.

In the cavalry barrack the ablution-room is on the same floor as the barrack-rooms ; close to the landing a bath is provided, and the cook-house has been placed on the opposite side of the landing.

But this cook-house is objectionable, both on account of its position and from its having no communication at all with the external air, and being surrounded with lath and plaster walls.

The cook-house of the infantry barrack is very small, confined, and dark.

The privies have been constructed with divisions, in consequence of a suggestion which we have made to the officer commanding Royal Engineers. They are flushed by Salter's apparatus.

We recommended certain improvements in this barrack on the spot ; such as the lighting and ventilation of the kitchen in the cavalry barrack, and the introduction of inlets for fresh air into the upper part of the corridors and rooms, for improving the ventilation ; also the admission of more light into the reading room, &c. The other requirements we have specified ought also to be supplied, as far as consistent with the state of the works.

This completes the list of barracks occupied by the Household Brigade in London.

## 12.—WINDSOR CAVALRY BARRACK.

These barracks form three sides of a quadrangle, the officers' quarters forming the centre, and the men's rooms and stables the two wings. The site is open and airy, at a little distance from the town. Each wing of the building consists of a long line of stables, over which are the barrack-rooms. These rooms are ranged on two sides of a central corridor, running the whole length of the building, and lighted only at the two remote opposite ends. The rooms enter right and left from the corridor, and have a window opening to the external air only on one side.

The following is the accommodation in this barrack :—

There are eight cavalry serjeants' rooms, with two men in each, affording 1,120 cubic feet per man.

Eight serjeants' rooms, with two men in each, and 896 cubic feet per man.

Four serjeants' rooms, with 25 men in the four, and 750 cubic feet per man.

There are 15 soldiers' rooms, which afford 448 cubic feet per man.

There are 19 soldiers' rooms, which give 500 cubic eet per man.

The following table gives the details of the men's accommodation :—

| Number of Rooms occupied by Men. | Total present Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 15 | 120 | 90 | 30 | 8 | 6 |
| 19 | 171 | 133 | 38 | 9 | 7 |
| 34 | 291 | 223 | 68 | — | — |

In the occupied soldiers' rooms there is, therefore, considerable overcrowding, and, in order to give to each man the due allowance of 600 cubic feet, two men will have to be removed from each barrack-room.

Eight rooms have been misappropriated for school-rooms, library, serjeants' mess, and kitchen, band practice and store-room.

These eight rooms, if otherwise suitable, would give about half the additional accommodation required for the men to be removed from the other rooms.

Besides deficiency of accommodation, this barrack has no day-room, no bath-room, no laundry, no specific accommodation for married non-commissioned officers and soldiers, no means of cooking in the kitchen, except boiling ; there is want of room for staff-serjeants ; the means of removing the stable manure appear to be inadequate, and there was a large accumulation at the time we were there. The soldiers' quarters present the great defect of being over the stables ; the ventilation is imperfect, the long corridors are dark and unventilated.

The privies are flushed by Salter's patent apparatus, but they have no divisions or doors.

The barracks are stated to be well drained. They are supplied with water partly from the waterworks, partly from wells.

The rooms are warmed by fires and lit with candles; the stairs and passages are lit with gas.

*The following are the Requirements for Health in these Barracks :—*

1. Ventilation of every barrack-room, by a shaft carried through the ceiling and roof, and means of admitting fresh air and diffusing it close to the ceiling.
2. Ventilation and lighting the corridors by grated openings in the floor, corresponding with ventilating skylights in the roof above.
3. Reduction of numbers to give every man 600 cubic feet of space.
4. An oven for baking and roasting to be put up in the kitchen.
5. Bath accommodation to be provided.
6. Manure to be removed at shorter intervals.
7. Latrines to have division of seats and doors.

These are the measures more immediately necessary ; but the other deficiencies above enumerated ought also to be attended to with as little delay as possible.

### Windsor Cavalry Hospital.

This hospital contains 36 beds and four wards, with nine patients in each. The average cubic space afforded to each bed is 733 feet.

The wards are of good height, light, having seven windows in each, and with ventilators in the ceilings, not carried above the roof, and acting imperfectly. There are two fire-places in each ward.

There is neither lavatory nor bath-room, and the only means of bathing is by one slipper-bath.

There is no laundry nor pack store, nor is there any proper store for provisions, or for bedding and other articles.

There is a good dispensary.

The kitchen and means of cooking are both good ; the supply of water is good. The water-closets are sufficient and good, but outside.

No hospital accommodation is provided for soldiers' families.

*We would recommend for this Hospital :—*

1. That a bath-room and lavatory be constructed.
2. That the hospital-yard, which is rather small, be extended rearwards, to afford means of exercise for convalescents.
3. That a privy, lately built outside the hospital walls, not more than 20 feet from the windows of the ward, but having its supply tank actually in the hospital, be removed.
4. That, as nearly as possible, 1,200 cubic feet of

space be allotted for each patient, by removing three beds out of each ward.

5. That the ventilation be improved by foul air-shafts carried from the ceiling above the roof, and by inlets for fresh air near the ceiling.

## 13.—WINDSOR INFANTRY BARRACK.

These barracks are situated in the town of Windsor. They are enclosed among high walls, and are built in the form of three sides of a square. The buildings are three stories in height. The men's barracks are in the centre, and the two sides are made up of quarters, &c., for officers and non-commissioned officers. The buildings are in separate blocks, close to each other at the ends. The local position and the construction of the barrack, surrounded by high walls and buildings, and having the back boundary wall close to the barrack-rooms, renders a thorough ventilation and movement of the external air difficult, if not impossible.

The basements are deep sunk, dark, and damp. They are at present used for lavatories, for which purpose they are not suitable.

The barrack-rooms run from back to front of the building, and have two windows at either end. The distance between the back and front windows is 52 feet, which is much too great to admit of free diffusion of light and ventilation within the rooms.

The staircases leading up to the barrack-rooms are of stone, but the landings are of wood.

There are 29 men allotted to each room by regulation, giving 373 cubic feet per man.

The following is the accommodation :—

| — | Number of Rooms. | Total Number of Men by Regulation. | Total Number of Men at 600 Cubic Feet of Space. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|---|
| | 30 | 870 | 540 | 330 | 29 | 18 |
| Attics | 13 | 52 | 39 | 13 | 4 | 3 |
| Total | 43 | 922 | 579 | 343 | — | — |

The barrack-master's return shows that the actual number of men in barracks, at the time the return was made, was 724. The accommodation, at 600 cubic feet, amounts to 579 men. The number on the schedule is 922 men, showing a deficiency of space for 343 men of the regulation number, and an excess in actual occupation of 145 men over the accommodation at 600 cubic feet per man.

The barrack-rooms are ventilated by air-shafts, carried from the ceiling to the open air above the roof, but as these air-shafts are twice unnecessarily bent in their course, the velocity of the air in them is considerably diminished. Besides which, as they are not separately supplied with air, the fire when it is lit draws the cold air down the shafts on the men's heads, and the shafts have consequently to be closed.

The lower rooms are dark and close, on account of the near proximity of the lofty boundary wall to the windows. The basements under them are also dark and damp. The air is, therefore, liable to become stagnant and moist. These rooms are chiefly inhabited by non-commissioned officers and their families, and on account of their defective sanitary state, arising from darkness, dampness, and defective ventilation, scrofula has appeared among their inmates.

There is neither day-room, covered drill-shed, bath-room, nor laundry belonging to this barrack.

There is no special accommodation for pursuing trades : two rooms were (at the date of the return) misappropriated for the purpose in consequence, one for a tailor's shop, and another for a drill-room.

The kitchen is provided with boilers, and there is an oven in a separate room. But it is not suitable for roasting meat.

The latrines and ash-pit are situated at one end of the buildings, in a narrow confined space, bounded by high walls, and close to the barracks. The latrines are merely open troughs, flushed out with water, but they were very offensive at the time of our inspection, and require improvement. The ash-pit should be abolished, and a suitable space provided instead of it, where an iron cart might stand to receive the refuse, and be removed once a day.

The water supply is partly derived from the water company and part from wells, and appears to be sufficient. The sewers are stated to be in good condition, and the drains trapped.

The defects of this barrack are partly structural. The high wall close to the back of the buildings interferes seriously with the light and ventilation. Unfortunately a public pathway runs immediately outside it, which would require to be diverted if the wall were to be removed further off.

There are rooms with windows opening into gloomy passages ; and the basements are not suitable for lavatories or bath-rooms.

These defects should be remedied with as little delay as possible.

*The following Requirements for Health should be immediately attended to :—*

1. Reduction of numbers of men in every one of the barrack-rooms, from 29 to 18, and in the attics from 4 to 3, and fixing these as the regulation numbers.

2. Admitting sufficient fresh air near the ceiling of each barrack-room to supply the ventilating shafts, through a partial wire gauze, or perforated zinc cornice, removing the bends from the ventilating tubes, and carrying them straight up to the roof. Ventilating non-commissioned officers' rooms.

3. Increasing the light and ventilation of the lavatories, as far as practicable. It would be much better, however, to provide new lavatories and bath-rooms at once.

4. Converting the flushed privies into water latrines, and providing them with suitable divisions of seats with half doors.

5. Filling up the ash-pit and providing an iron cart for the reception and daily removal of barrack refuse.

6. Roasting oven to be provided for the kitchen.

7. Day-room to be provided. The other deficiencies mentioned, as also the want of staff-serjeants' rooms, require to be supplied ; but the points above stated include what is immediately wanted for health.

### Infantry Hospital, Windsor.

This hospital is situated at some distance from the barrack.

It contains 10 wards, giving accommodation for five, six, and nine beds each, and an average cubic space of 767 feet per man.

The passages and staircases are rather narrow. The windows have the upper sash on pivots. There are ventilating beams in the lower, and perforated openings in ceilings of the upper wards, but they do not act satisfactorily, and the ventilation is imperfect.

There are two good waterclosets on both floors, built outside the body of the building, ventilated, and supplied with water.

The hospital is warmed by ordinary fire-places.

The kitchen is good, but means of roasting are wanted.

There is no ablution or bath-room, and the common slipper bath has to be supplied with hot water from the kitchen.

On the outside of boundary wall there is a stagnant noisome ditch, which should be drained and covered over.

There are three rooms for orderlies or nurses.

The passages only are lighted by gas; candles are used in the wards.

There are two water tanks, one supplied from the Thames, the other by rain water. The supply from the former occasionally fails, and is considered too small on that account.

The sewerage is effected by earthenware pipes; it is stated to be good.

There are no pack or bedding stores, and a hospital-serjeant's quarter is much wanted.

*The Improvements required for this Hospital are* :—

1. Allotting 1,200 cubic feet of space for each patient.
2. Draining and covering the ditch outside the boundary wall.
3. Providing a lavatory and bath-room.
4. Improving the ventilation by shafts from the ceilings of some of the wards.
5. Means of roasting for the kitchen.
6. Stores, and a hospital-serjeant's quarters.

## 14.—HAMPTON COURT CAVALRY (OLD) BARRACK.

This barrack is placed in an open, healthy situation near to the palace. It consists of one strip of building, containing stables, with dwelling rooms over them. There is a thoroughfare in front of and around the barrack, without separation by wall.

The building is constructed to accommodate 73 men. It contains two troop-rooms, the larger capable of accommodating 45 men according to regulation, and the smaller 25 men. Both numbers exceed the available space, which in the larger room would afford the regulation number of men no more than 530 cubic feet per man, and in the smaller room only 350 cubic feet per man. To give 600 cubic feet per man would require the regulation number in the larger room to be reduced from 45 to 40, and in the smaller room from 25 to 14. The present occupants of both rooms fall short of both these numbers, so that at present there is plenty of cubic space.

For ventilation there are numerous apertures in the ceilings, with slides to open and close when necessary. In No. 2 room there are five air bricks in the front wall, placed in the centre of piers 4½ inches from the floor, and eight ventilators with slides in the ceilings for foul air.

This barrack was formerly appropriated for the servants of the household when the palace was in the occupation of the Court, and from the large size of the rooms the barrack-master states that they are cold in winter, and that the means of warming are deficient. The fire-places are very open and lofty, and allow of great waste of heat up the chimney.

The guard-room is on the same floor with the troop rooms. It has not sufficient means of ventilation. All the rooms are rather low-pitched, but having windows on both sides, they are light and may easily be ventilated. A screen, or partition, thrown across the larger room would add to the comfort of the men in winter.

There are two staircases of wood leading to the rooms, one of them having communication with the stables by a door on either side of the entrance, which affords every facility for effluvia ascending to the rooms above.

The ablution-room, which is without a bath, is a small portion partitioned off from a small uncomfortable day-room on the ground floor. The latter is fitted with forms and tables, and, being close to the kitchen, is used by the men to dine in.

The wash-house, which serves also as a cleaning shed, is close to the stables.

There are no means of baking or roasting meat in the kitchen.

There are quarters for two officers adjoining the men's barracks. The others, as well as the mess establishment, are accommodated in a hied house.

The stables are lofty, but too crowded.

The surface drainage is carried off by pipes. The latrines are without water or drainage, and are connected with a cesspit. They might be easily arranged as water latrines, and flushed with water.

Close to the latrines, and at the entrance and front of the barracks, are the manure heap and ash-pit, very objectionably placed. This is unavoidable, however, on account of the circumscribed site and want of space; but the nuisance arising from them might be materially diminished by draining and flushing the latrines, and by frequent removal of the stable manure and barrack refuse.

The whole of this barrack is old and in bad repair, and it would not be advisable to expend much money on it. But as in all probability it will continue to be occupied, we would propose to limit our recommendations barely to those matters required for health and decency.

*These are as follows* :—

1st. Reduction of the regulation number of men in the larger room from 45 to 40, and in the smaller room from 25 to 14.

2nd. A wooden partition to be run across the middle of the larger room.

3rd. The throat of each fire-place to be contracted, without diminishing the height of the chimney breast.

4th. The staircase leading up from the stables to be ventilated through the roof, to prevent the effluvia entering the troop-rooms.

5th. Latrines to be reconstructed, and converted into water latrines, and flushed daily; also to have division of seats and doors to them. Manure and ash-pit to be improved.

## 15.—HAMPTON COURT NEW BARRACK.

This barrack contains accommodation for 51 men.

The buildings form three sides of a square, enclosing a very small barrack-yard, in which on one side are placed the kitchen, a small wash-house, privies, ashpits, and urinals, the latter being close to the gate. In the same line are also the manure heap, privy cesspit, and the well which supplies water for the barrack, the latter about 30 feet only from the former.

Opposite to these offices are the stables, with the men's rooms over them.

The rooms are reached by a light and well ventilated staircase, unconnected with the stables, leading to a light central passage, with windows at both ends, and giving access to three rooms on each side.

The rooms accommodate eight men each. They are six in number. In two of the rooms each man has 585 cubic feet of space, and in the remaining four the cubic space per man is 577 feet. The doors open close on the fire-places. They require to be removed to the opposite ends of the rooms.

For ventilation there are two apertures in the ceiling of each room, with slides that can be opened and closed at pleasure.

There is no day-room, library, store-room, or covered shed for drill.

There is no accommodation for pursuing trades, or special accommodation for married soldiers, neither is there any separate sleeping or mess accommodation for non-commissioned officers.

The cook-house is provided with two boilers, but has no means of baking.

Water is obtained from two pumps. It is said to be disliked by the horses, and as the well is dug in a gravelly soil at so short a distance from the cesspit, there is great risk of the well being polluted.

The ablution-room is on the ground floor, between the stables. It is not supplied with water.

The latrines have surface drainage only. The soil is collected in an adjoining cesspit. There is no water for flushing, no division of seats, and the whole arrangement is extremely offensive.

Opening from the principal yard is a still smaller enclosure, containing three loose boxes and dispensary for the veterinary surgeon.

This barrack is built on a gravelly soil, in an open and airy situation, without any houses close to it, to which circumstances alone it probably owes a reputed healthfulness to which its internal structure and arrangements give it little claim. The small extent of area, the arrangement of out-offices, and deficiency in conveniences, render it inadequate to the ordinary wants of even the small number of men it is intended to accommodate.

*The following Improvements might be carried out with advantage to Health:—*

1st. Ventilation of each room by a shaft carried through the roof, and apertures for admitting air through perforated zinc close to the ceiling.

2nd. Moving the doors to the end of the rooms furthest from the fire-places.

3rd. Supplying a roasting oven for the kitchen.

4th. Drainage of the entire barrack to a suitable outfall, and removing the whole drainage of the latrines, stables, urinals, midden-stead, &c., to a safe distance instead of allowing it to penetrate the subsoil and endanger the purity of the water supply as at present.

5. Reconstruction of latrines, and introducing the water latrine with divisions of seats and half doors.

## 16.—GUARDS' BARRACK, CROYDON.

These barracks were originally built in 1797, for the Waggon Train; part of them were used as stables, and they are of slight temporary construction: they are situated on the western side of the town of Croydon, on low ground, about one eighth of a mile from the banks of that branch of the Wandle which rises near Croydon. They are chiefly appropriated to the recruits of the Foot Guards, and are scheduled to accommodate 500 men.

The subsoil on which the barracks are built is gravel, and the surface is raised very little above the water level of the country.

The barracks occupy an area of about 10A. 3R. 2P. in extent.

They consist of three blocks, of two floors each, identical in form. On the lower floors are ablution-rooms, stores, school-rooms, reading-rooms, and barrack-rooms; and on each upper floor are placed two barrack-rooms and non-commissioned officers' quarters; there is a fourth block which contains four large rooms with a passage between them, occupying one floor on the ground.

There are in all 18 rooms, 3 of which are on the construction for 38 men, 7 for 20, 7 for 28, and 1 for 10. Three of the rooms for 20 are temporarily appropriated as school-rooms. Deducting the misappropriations, there are at present 30 men in the rooms beyond the regulation accommodation.

The accommodation in Croydon barracks is as follows:—

| Number of Rooms. | Total Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 7 | 140 | 112 | 28 | 20 | 16 |
| 7 | 196 | 126 | 70 | 28 | 18 |
| 3 | 114 | 87 | 27 | 38 | 29 |
| 1 | 10 | 8 | 2 | 10 | 8 |
| 18 | 460 | 333 | 127 | — | — |

The total deficiency of accommodation is that for 127 men, and the total accommodation will only afford space for 333 men.

To effect the necessary reduction in numbers every room of the first seven in the list must have its number of inmates reduced from 20 to 16.

The numbers in each of the second seven must be reduced from 28 to 18. In the third set of three rooms the numbers must be reduced from 38 to 29 in each; and the room with 10 inmates must have two taken from its occupants.

An addition to the number, over and above that already given, of two men to each room, has been made by order, so that our estimate of deficiency refers solely to the regulation number, and not to the actual number in barracks.

Within the enclosure are situated—a hospital, a building for the officers, covered sheds for drill, a riding-school, and cook-house, privies, &c.

The several buildings are at a distance from each other, leaving the barrack-yard open and airy.

The walls of the barracks are of brick for a height of about four feet, above which they are of wood. The roofs are tiled.

In the three main buildings the rooms are low and deficient in light and ventilation.

The joists supporting the floor boards of the lower rooms, which were originally stables, are laid on the ground, and have no ventilation beneath them.

It is stated that the rooms, especially the upper ones, are cold in winter and oppressively hot in summer. Dampness is also complained of in some of the lower rooms.

Since the beginning of January there have been 26 cases of scarlet fever, 10 of them having originated in the lower rooms of No. 4 barrack. This disease, it is stated, is of frequent occurrence, and is no doubt to be attributed to the nature of the site, overcrowding, and want of ventilation, (also to other circumstances mentioned in the report on this disease appended.)

The upper floor of each block is approached by an outer staircase and gallery, and besides barrack-rooms, contains accommodation for serjeants. Behind each barrack-room, under the slope of the roof, is placed a store closet.

The ablution-rooms are at the ends of the buildings, and occupy what were formerly stables; each contains a bath with means of warming water. The lavatory floors are rough boulder stone pavement, the benches of wood, and of the rudest construction.

A small wooden building, designated as a laundry, is deficient in every convenience and is misappropriated as married quarters. There are two cook-houses, each of which is built round a central chimney; one is fitted with boilers only, the other is supplied with an oven; but this oven is not sufficiently large to bake for more than 100 men.

The seven barrack-rooms are warmed by stoves, the others by fire-places, stoves being placed in the lower rooms. The flues pass through the upper rooms, and assist in warming them. There are three ventilating openings in the ceiling of each room, one of them under control. There are also ventilating openings near the floor.

The privies are flushed every day, but they have no divisions between the seats nor doors.

The water for the barracks is derived partly from the Croydon Waterworks Company, who supply 5,000 gallons daily, for which 100*l.* per annum is paid, and partly from wells which furnish any further quantity necessary for the trouble of pumping.

The guard-room is close and unventilated.

Even were the site unexceptionable, the expense of putting this barrack into good order would be very great, on account of the dilapidated condition of buildings, and the temporary materials of which they are constructed. It would be better to provide another barrack rather than to incur the cost required to put the present one into a thoroughly efficient state. To do so, it would be necessary to take up the floors which are laid on the ground, to raise the roofs, and to introduce ventilation under the floor-

boards, besides other expensive repairs and alterations throughout the entire buildings.

As it will be necessary to occupy this barrack until other accommodation can be provided, we shall restrict our requirements to what are barely requisite for health.

*They are as follows:—*

1. Reduction in the numbers of inmates in every barrack-room to the extent pointed out.

2. The barrack-rooms to be ventilated by means of shafts through the ceilings and roofs and an arrangement to be made for admitting fresh air near the ceiling, through perforated zinc plates.

3. The four large one-floor barrack-rooms in the separate shed near the riding-school should be ventilated through the roof, provided with additional light and with additional fire-places. In their present state they are unfit for occupation. Even the men's boots get mildewed in them, and it was in these sheds that scarlet fever first appeared.

4. The ablution rooms to be put in order, properly paved, and additional bathing accommodation provided.

5. An oven to be provided for each kitchen, in which meat could be both baked and roasted.

6. The ash-pits to be covered, and the privies to have divisions and half doors.

### *Croydon Barracks Hospital.*

The hospital is built of brick, and is situated close to the boundary wall, overlooking a field where pigs are kept, with a manure manufactory connected with the Croydon drainage at a short distance beyond. It is a small defectively constructed building; the rooms are low, badly arranged for ventilation, and much overcrowded. These rooms contain four and eight beds each. The ventilation might be improved by introducing shafts through the ceiling, with a means of admitting air near the upper part of the room, and diffusing it through perforated zinc. It would also be of advantage to enlarge the door leading from the staircase to the gallery, and to shift the present doors of wards from the corners of the latter, by which the waterclosets now close to the entrance of wards would be isolated.

The arrangement of out-offices of the hospital is very defective; there is no bath-room, and the kitchen requires an additional oven, and also ventilation.

The dead house, which is in a confined yard at the back, is very badly placed, small, and inconvenient.

The provision store consists of a small cupboard under the staircase, and there is no accommodation for either packs or bedding.

There is no ablution-room, nor waiting-room for patients.

It is stated that in winter the hospital is cold and damp; that the windows are bad and insecure, and admit the wind.

*The following are the Sanitary Requirements for the Hospital:—*

1. The cubic space per bed allowed in the hospital being not much more than a third of what it ought to be, two-thirds of the beds to be removed out of the wards. Under the special circumstances of the case, and unless additional accommodation can be provided on the spot, we would propose to remove half the beds as a temporary expedient, and that every ward be ventilated from the ceiling in the manner already recommended for the barrack-rooms.

2. A bath, with hot and cold water laid on, to be provided; also an additional oven to the kitchen.

3. Pack, provision, and bedding stores are also much wanted; but to supply these, and other requisites, would necessitate considerable additions being made to the hospital. And, after all, it would hardly be fit to receive sick.

The best course would be to provide a better barrack and hospital on a less exceptionable site.

## 17.—HOUNSLOW CAVALRY BARRACK.

The site of this barrack is not much raised above the level of the Thames, but it is open and airy, and at some distance from other buildings.

It forms three sides of a square, close to the high road, the officers' quarters forming the centre block, and the men's barracks the two wings. The barrack is constructed to accommodate 259 non-commissioned officers and men.

The following is the men's accommodation :—

| Number of Rooms. | Regulation Number of Men. | Actual Number of Men. | Accommodation at 600 Cubic Feet per Man. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 29 | 232 | 290 | 174 | 10 | 6 |

There are 2 non-commissioned officers' rooms with 1 man in each, and 1,954 cubic feet of space. There are 12 non-commissioned officers' rooms with 2 men in each, and 977 cubic feet per man.

There are 29 troop-rooms. The regulation number of men in each of these rooms is 8, giving a cubic space of 488 feet per man. The actual number of men in each room is 10 instead of 8, so that the present cubic space per man is only 390 cubic feet. Each barrack-room would practically contain only 6 men at a little more than 600 cubic feet per man, so that the regulation number of men in these 29 rooms exceeds the accommodation by 58 men, and the actual number in the rooms exceeds the accommodation by 116 men.

The barrack-rooms are over the stables, and are entered right and left from a long central passage, lighted imperfectly by windows at the end, and skylights at long distances from each other. The ventilation is by means of a sliding fanlight over the door, and two apertures in the ceiling of each room with slides, that can be opened and closed at pleasure. There is one large window opposite the door in each room.

The rooms and passages are low pitched and defectively ventilated.

There is no day-room. There are two good cookhouses, one for each wing, with boilers and a pump in each, but no means are provided either for baking or roasting meat.

One room is set apart for a serjeant's mess, but the cooking has to be done in it, owing to there being no kitchen for the purpose.

There is no special accommodation for the families of married soldiers.

There are several misappropriations of men's rooms for school-rooms, library, &c.

The wash-houses are very bad, and wanting in every convenience, excepting boilers. There is no drying apparatus or laundry stove.

There is one detached ablution house placed at the end of each wing. It is inconveniently distant from most of the rooms; is supplied by a pump only. There are no baths. Three at least are required for the strength in barracks.

The forge and other shops for trades are too small.

The manure heaps are here allowed, as in cavalry barracks generally, to accumulate to too great an extent before the dung is removed, and the manure pits require entire reconstruction.

The whole barrack is without drainage in the proper sense of the term, and there is at present no available outlet for the barrack sewage.

The men's privies are the worst we have yet seen. They are neither drained nor supplied with water, and are most offensive.

The privy of the guard-room is badly placed, and communicates damp and unwholesome effluvia to the adjoining cells.

The drainage in rear of the officers' quarters is

complained of. A long open ditch runs along the whole of one side of the boundary wall, and receives the water from urinals, stables, and manure heaps. This ditch is a constant source of complaint, and requires to be properly drained and covered over.

*The following are the Requirements for Health in this Barrack :—*

1. Reduction of the numbers on the schedule of each room from eight to six men, and providing additional accommodation for the men removed from the rooms.
2. Ventilating every room by a shaft, carried up from the ceiling through the roof, and an inlet for air in the wall, near the ceiling, properly covered with perforated zinc.
3. Drainage of the barrack, ablution of cesspools, and draining and covering the offensive ditch on the east side of the barrack.
4. Water latrines, with suitable flushing apparatus, to be provided.
5. Drying stove to be provided for laundry.
6. Bath-room, with hot and cold water, to be provided.
7. Kitchen to be provided with means of roasting and baking meat.

*Hounslow Cavalry Hospital.*

This hospital consists of three stories. It is badly placed, behind the officers' quarters, near to the infirmary stables and their manure heap, and close to the open noisome ditch already mentioned, outside the boundary wall of the barrack.

There are six wards and 38 beds, and the average cubic space per bed is 649 feet.

There are four windows in the larger wards, two at each end. The staircase is narrow, but light and well ventilated.

The wards are partially ventilated by iron gratings placed near the floor, and they have also circular openings in each ceiling communicating with the external air. The ventilation is defective. The lower inlets should be closed, and each ward should have a shaft carried from the ceiling above the roof, and suitable inlets close to the ceiling.

There are no water-closets within the building, and much inconvenience is felt in consequence.

The ablution-room is small and damp ; it is provided with a slipper bath, but there is no fixed bath and no boiler.

There is a covered shed for exercise in the small yard at the back.

There is no laundry, and no hospital accommodation for soldiers' families.

The provision store is only a small cupboard.

Water is obtained from a force pump in the kitchen.

The outside privy is badly constructed, in a damp yard, and is without water. It is close and ill ventilated. This privy is drained to a cesspool in the vicinity.

*We recommend with regard to this Hospital :—*

1. That ventilating arrangements similar to those required for the barrack-rooms be introduced into the wards, and the lower air-gratings closed.
2. That 1,200 cubic feet of space be set apart for each patient.
3. That water-closets connected with the hospital, but separately ventilated, be constructed and drained, and the privy cesspool abolished.
4. That additional bath accommodation, and a suitable lavatory, be provided for the sick.

## 18. THE HOSPITALS OF THE REGIMENTS OF GUARDS.

All these hospitals are situated in streets of Westminster, a low and rather confined locality for the purpose, and they are all, more or less, enclosed among the habitations of the civil population.

All have small yards in front towards the street ; and only one of them, that occupied by the "Coldstream Guards," is open at the back as well as at the front.

The hospital of the "Grenadiers" is more shut in by other buildings than the others, but in accommodation and general construction it stands next to the "Scots Fusiliers," which is greatly superior to the others in every respect, except the site, in which it is inferior to the "Coldstream" hospital.

With the exception of the defects alluded to, the hospitals of the "Grenadiers" and "Fusiliers" are used for the accommodation of about 100 patients each. Some of the wards are of good size, and the offices convenient, especially those in the latter.

The Coldstream hospital is an old building. The staircase is narrow and circuitous, the wards small and low pitched, and the whole inconvenient and ill-adapted. A new building on the same site is, we understand, contemplated.*

These hospitals, though defective as to site and construction, are in good order and kept very clean, especially that of the Fusiliers. They are the property of the regiments, and supported from the stock purse fund of the Guards, consequently they provide for their own improvements.

## 19. GUARDS' LODGING HOUSE FOR MARRIED SOLDIERS.

The lodging house for married soldiers of the Guards is situated in Vauxhall Road. It is of good construction, and gives accommodation to 54 families.

The staircase is spacious, light, and well ventilated. The rooms, which have access from a narrow central passage, are convenient, of good size, well ventilated, and are provided with ranges containing oven, boiler, &c., with other conveniences.

In the basement are laundries, which are provided with a drying apparatus and a wringing machine.

These, as well as other offices, are small and somewhat confined on account of the restricted area of the site. The buildings are, however, at present, at some distance from other buildings, and the position is generally airy.

From 3*s.* to 4*s.* a week is paid by the occupants, who have either two or three rooms each.

There is an abundant supply of water, by high pressure, from large cisterns on the flat roof, which latter is formed of asphalt.

In water-closets, shafts for refuse to basement, sinks, and water supply to each house, general cleanliness, arrangement, and means of ventilation, the whole is admirable, and affords an example well worthy of being followed.

We are informed that this building has been erected at their own risk and cost by the officers of the Guards.

## GENERAL SUMMARY OF IMPROVEMENTS FOR THE METROPOLITAN DISTRICT.

It appears to be advisable to conclude this our first interim report with a few general considerations on the nature of the sanitary improvements suggested by our examination of the barracks of the metropolitan district.

*Cooking.*—We have directed trial kitchens to be constructed in the Wellington barracks, which, we hope, may serve as models on which barrack kitchens ought to be framed, in terms of the requirements for cooking laid down by the Royal Commission.

*Overcrowding.*—One of the most important points in this *interim* report is that of increased barrack accommodation. According to our instructions, we are required to fix the number of men in each barrack-room ; to have the number painted on the door, and to report to the Secretary of State for War the extent of accommodation which ought to be provided, in order to enable the requirement of 600 cubic feet

* These remarks apply to the old hospitals, since rebuilt.

of space, as laid down by the Royal Commission, to be provided for each soldier.

If, in endeavouring to comply with our instruction, we leave out of calculation the new barracks at Kensington, and also the old infantry barracks, the question of barrack accommodation will stand as follows :—

In Wellington barracks there were at the time of our inspection 1,447 men (the regulation number being 1,354) in the cubic space for 1,134 men, showing an excess of 313 men over the accommodation.

In St. George's barracks there were 517 men (the regulation number being 476) in the space for 414, showing an excess of 103 men.

In the Tower barrack there were 732 men in rooms which ought to contain no more than 587, the excess in this case being 145 men.

St. John's Wood barrack was unoccupied, but its rooms would accommodate no more than 121 men instead of 220 on the schedule, showing an excess of 99 men.

Portman barrack contained 422 men in rooms, the regulation number in which is 483 men. The number that can be accommodated at 600 cubic feet each is 276, showing that the actual occupants were 146, and the regulation occupants 207 in excess of the accommodation.

In the Magazine barrack the regulation number of men is 79. Deducting 14 men for a room misappropriated as a school-room, the regulation accommodation would be for 65 men. But the accommodation would only be suitable for 42 men. The actual number of men in the barrack-rooms was 44, a little more than the proper number.

Excluding the excess of occupants over and above the proper regulation number, as having no right to accommodation, the following table shows the comparison between the *regulation* accommodation and the accommodation at 600 cubic feet per man :—

| Accommodation according to existing Regulation. | | Accommodation at 600 Cubic Feet per Man. |
|---|---|---|
| | Men. | Men. |
| Wellington - | 1,354 | 1,134 |
| St. George's - - | 476 | 414 |
| Tower - - - | 732 | 587 |
| St. John's Wood - | 220 | 121 |
| Portman - - - | 483 | 276 |
| Magazine (exclusive of school-room) - | 65 | 42 |
| | 3,330 | 2,574 |
| | 2,574 | |
| Excess of regulation number over accommodation - - | 756 | |

It hence appears that the regulation accommodation in these barracks is intended for 3,330 men, while the actual accommodation is sufficient for no more than 2,574 men, leaving a deficit of space for 756 men. If all the infantry barracks were occupied up to their accommodation at 600 cubic feet per man, they would hold 2,574 men, and no more. If we suppose that Kensington new barrack would accommodate the men displaced by the demolition of Kensington old barracks, it follows that barrack accommodation must be provided for every infantry soldier beyond 2,574, in order to enable our instructions regarding cubic space to be carried out.

The cavalry barracks, with one or two exceptions, are not overcrowded by their present number of occupants, but to prevent overcrowding in the event of any increase of force, the numbers on the schedule of each barrack should be reduced, as already pointed out, and 600 cubic feet allotted to each man.

*Ventilation.*—Another of our recommendations, namely, the ventilation of barracks, involves practical points of considerable difficulty. These we have had under consideration for some time, and, in order to aid us in the solution of them, we have consulted the most competent authorities ; and we have, besides, introduced experimental works which are now in operation, and so soon as we shall have had sufficient experience of their comparative value, we shall report the results in detail.

We have in the meantime laid down as a standard to be attained, that in barrack-rooms provision should be made for the removal of 1,200 cubic feet of air per man per hour.

After a careful consideration and trial of several plans of ventilation, and after examining others in operation in various localities, we have come to the conclusion that in barracks and hospitals already constructed, any general system of ventilation for the entire building would be expensive and difficult to apply ; and that it is therefore necessary that each room should be made independent of the rest, so far as its supply of fresh air is concerned.

In hospitals, the medical officer and the nurses can keep a constant watch over ventilators and prevent them from being tampered with ; but, in barracks, although it is essential that the ventilation should be placed under the supervision of the medical officers ; yet its operation could only be inspected occasionally, and between the times of inspection it must be left very much to the mercy of the soldiers.

It is, therefore, essential that, in arranging for the admission of fresh air, draughts should be avoided as far as possible ; that is to say, that the air intended for the purification of a whole room should not be delivered into it as at present in a mass close to one of its occupants.

The result of our experiments on various systems of ventilation, so far as they have gone, is, that the following arrangement appears to be the cheapest and most effectual method of ventilating barrack-rooms.

The chimney should form an essential part of the room ventilation. But in addition to the chimney, ventilating shafts should be carried from the ceilings of the rooms up through the roof, terminating in a louvred turret to prevent the rain from beating down.

The inlets afforded by the spaces under and round the doors and windows are not sufficient to admit the air necessary to replace that which should be removed by the shaft and chimney ; and hence, when the fire is lighted, these shafts, if their draught is not supplied with air from without, will not only not remove the heated air, but will act as inlets for the supply of air to the chimney and room, and will thus occasion down draughts on the heads of the men. This can only be remedied by providing additional openings as inlets to supply fresh air both to the shaft and chimney.

In order that the air may be brought in with as little inconvenience to the occupants of the room as possible, we have found it desirable to break the force of the current by placing the inlets near the ceiling, and covering them with a board which slants upwards ; the bottom of this board is fixed against the wall, inside the room, below the lower part of the opening which admits the air ; the board itself being inclined at an angle of 45° towards the ceiling, so as to throw the air which enters the room up towards the ceiling. This board extends on each side of the opening. The open space between the upper part of the board and the wall is covered with perforated zinc, the holes of which are from 1-10th to 1-8th of an inch in diameter ; but the part immediately over the opening is boarded over so as to prevent the air from entering the room directly, and to compel it to seek an entrance into the room through the whole area of the perforated zinc. The object of this arrangement is to cause the air to enter with a diminished velocity into the room, and to be more thoroughly diffused, and the area of the perforated

zinc should therefore be from six to eight times, at least, that of the inlet from the outer air.

By removing air from a room and supplying its place with air from the outside, the temperature of the room is lowered; and if the circulation takes place with sufficient rapidity, the temperature would be assimilated to that of the outer air. The velocity with which the air is removed depends partly on the difference of temperature between the inside and outside of the rooms; and as the temperature in the room is diminished, the velocity of circulation is also diminished or arrested.

In very cold weather it is possible that, in some cases, inconvenience would be experienced by a proper amount of ventilation, unless means were introduced of warming the air. It is, hence, very important that whilst the removal of foul air and the supply of fresh air should be ample, the amount of heat maintained in winter should also be sufficient.

The simplest way of effecting this for existing barracks, would be to place an earthenware stove in the passages, under which the fresh air could be admitted and warmed, inlets for admitting air into the rooms being placed so as to open into the passage, at least in cold weather. But this plan has the objection that it would make the ventilation of the rooms opening out of the passage common to all of them; the principle of supplying fresh air to the rooms directly from the outer air would be interfered with, and the rooms might be supplied with each other's foul air; all the dust of the passage would pass through the ventilators into the room, and the noise from the passage would also be considerable in the room.

According to the present construction, all barrack-rooms are provided with fire-places, and we think that it is most desirable that (even as a means of ventilation only) this system should be continued; hence, in the case of all new barracks, and of any existing rooms where the cost would not be very great, we have thought it worthy of consideration whether an arrangement could not be made to introduce air into a chamber formed behind the fire, and separated from it by means of firebrick, from whence the air moderately warmed would pass up and be admitted into the rooms, near the ceiling, as before described.

By this means a saving would be effected in the fuel otherwise necessary to warm the rooms when ventilated during cold weather. We have found that the fireplaces in most barrack-rooms have been constructed without any reference to that form of grate which would afford the largest amount of heat with the smallest expenditure of fuel. We have thought this subject deserving of immediate consideration, because even if, by furnishing properly devised grates, no saving of fuel is obtained for the public, the present allowance of fuel would be much more effectual for providing for the comfort of the men. The principles upon which fireplaces in barrack-rooms should be constructed are, that the grate should be placed as forward as possible; the sides and back should be of fire-brick; the sides should be splayed so as to throw the heat as much as possible into the room; the opening into the chimney should never be closed by a *register;* and the height of the chimney breast should never be less than 3 feet 6 inches.

In guard-rooms, where the application of the method of warming the air suggested above would be easy, and not very expensive, we think it desirable that the admission of air should be managed so as to ensure its being warmed, a shaft for exit being provided at the ceiling.

In serjeants' rooms, married quarters, and small rooms, a similar arrangement for the admission of warm air is desirable. An Arnott's ventilator, with a silk valve, should be placed in the chimney to assist the removal of the foul air when the fire is not lighted; or, when gas is used, it would answer quite as well to lead a pipe, about two inches in diameter, into the chimney from a funnel in the ceiling, over the gas, through which the products of combustion, as well as much of the impure air of the room, would pass into the chimney.

We would here observe that the contents of quarters for married men consisting of single rooms should not be less than from 1,500 to 2,000 cubic feet.

In hospitals the amount of impure air to be removed by open windows, chimneys, and foul-air shafts, should be at least 3,000 cubic feet per hour per patient.

We think it very desirable that the air of each ward in a hospital should be derived directly from out of doors, without the possibility of mixing with the air of other wards.

We should therefore propose that, when it can be done, the air should be brought in behind the fireplace, to be warmed in a chamber lined with firebrick, and admitted into the room near the ceiling, an inlet for air being also placed so as to bring in air directly from without, and a shaft being carried up from the ceiling to remove air from the top of the room.

In other words, we propose to introduce *natural ventilation* instead of any artificial method, only facilitating, by the proper arrangement of inlets and outlets for air in a room, that circulation which naturally takes place as soon as the balance of the atmosphere has been disturbed in any particular place by difference of temperature or by winds.

Besides the simple methods indicated above, various forms of ventilators for barracks and hospitals have been proposed to us for ensuring more or less perfectly similar results. It would be premature at present to enter into any discussion as to their efficiency, but we shall do so on a future occasion.

*Privies, Urinals, and Urine Tubs.*—In the privies of the barracks in London, the almost universal arrangement is for the soil to fall into a receptacle containing water, which is flushed once or twice a day.

Having regard to the trouble which is required for keeping ordinary water-closets, or even common soil pans, free from being choked, and also having regard to the very large number of privies required in a barrack, we do not think that any other arrangement would be so simple and effectual as the one in use, provided the receptacle be not too deep, and the means of flushing be ample, and be used frequently.

The seats should be separated by a partition, and *doors*, or rather *half doors*, should be provided to cover the upper part of the opening between the partitions where it can be done without difficulty.

For ventilation, a louvred turret should be placed above the roof, inlets for air being provided in the most convenient places, either by air-bricks or perforated panes of glass.

With regard to light, we think that there should be, at least, one superficial foot of opening to each seat, but more would be desirable where it can be introduced without difficulty.

Urinals should not be under the same roof with the privies, but should be protected from rain, and should, if possible, be constantly supplied with water.

We have considered very carefully the question of what substitutes should be made for *urine tubs*.

We have examined a great variety of fixed urinals, but we fear that they would be found offensive if placed in barrack-rooms or on the staircase landings, and that if employed at all, it must be in recesses projecting from the main building and admitting of thorough ventilation.

The expense of making such an arrangement in existing buildings would be considerable. We think that in new barracks it would be desirable that a fixed urinal should be placed near each barrack-room, and a water-closet erected for each staircase.

For existing barracks freedom from nuisance would apparently be best secured by the use of a

moveable utensil, and we have a number of forms on trial; but as yet no positive results have been arrived at sufficient to warrant us in recommending any general substitute for the present urine tub.

*Cooking.*—The means for baking and roasting, as well as boiling and stewing, together with a small supply of hot water, should be provided in all permanent barracks.

The apparatus for these purposes should be of simple construction, and capable of being easily cleaned.

A boiler and roasting oven, with means of regulating the fire, will, so far as we have had experience, afford every required means of varying the soldiers' cooking.

For camp purposes we believe that the most economical arrangement will be to adopt Soyer's iron stoves; they are very simple, and not liable to get out of order. They dispense with brickwork, which becomes injured by the fire.

We have various simple and economical arrangements of ovens and boilers for barrack and hospital use at present on trial, the result of which will no doubt enable us to introduce improved forms of cooking apparatus.

But something more than a mere cooking apparatus is wanted. The soldier requires instruction as to the best mode of preparing his food, so that he may derive the greatest amount of nourishment it is capable of yielding. At present, his ration of meat is not unfrequently issued in small portions instead of joints; thrown into cold, warm, or boiling water, as may be most at hand, and a large and strong fire kept up from the beginning to the end of the process. The result is indifferent soup, and nothing more. It is all the soldier gets in the shape of nourishment from the meat. We, therefore, recommend that a few plain directions as to boiling, roasting, and stewing should be hung up in a conspicuous place in every barrack kitchen.

The adoption of this recommendation would, in our opinion, tend greatly to improve the cooking of the army.

We further recommend, that for a limited period one man in each regiment should be told off to learn and teach such a system of cooking as may be approved of, until the method be thoroughly established among the men.

*Conclusion.*—The barracks of the London district may be considered to be a favourable type of the barracks which exist in the United Kingdom. The main feature for notice in them is, that no uniform system has been pursued in originally designing them. No doubt when the officer in charge took an interest in works of this description, details have been attended to, and improvements made; but these details and improvements have not generally been the result of any system laid down by a central department, but have depended upon the energy or knowledge of the officer employed.

Neither has there been any method pursued in respect of sanitary requirements. Ventilation has not been systematically attended to; in the rare cases where the privies have been improved, it has been done upon no uniform plan; the cook-houses contain conveniences or not, according to the more or less importance attached to them by the designer.

It is not that money has not been spent upon sanitary arrangements, but the money so spent has not been applied upon defined principles, and hence barracks exhibit so few of those systematic arrangements for health and convenience which have been introduced of late years into the model dwellings for the labouring classes.

At the same time we must call attention to the fact that the barrack department has for the last two or three years appropriated 40,000*l.* per annum to improving existing barracks, which sum has chiefly been systematically spent in providing married quarters.

Previous to the Russian war, before the Ordnance was transferred to the War Department, Sir John Burgoyne had directed the commanding engineers, at the principal home stations, to consult the surgeons, barrack-masters, and commanding officers, upon the defects of the newly constructed barracks, to obtain a sound basis for future improvements, and valuable reports were received in reply.

With these remarks we beg to conclude this interim report, which we have thought it right to prepare, in order that the Secretary of State for War may be made acquainted with the character of the more prominent sanitary defects in these buildings.

We append a rough estimate of the cost required for the removal of the evils which we have pointed out, from which it will be seen that independently of the *additional accommodation* required, it is not so much a large expenditure of money, as the application of the money in a judicious manner which is necessary for the removal of the principal existing sanitary defects of the barracks in the London district.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Right Hon. the Secretary of State for War.

June 8th, 1858.

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## ADDENDUM TO REPORT ON CROYDON BARRACKS.

### *Report on the Fever in the Guards' Barracks, Croydon.*

In compliance with the request contained in Lord Hardinge's letter of the 4th November 1858, to the Right Hon. Sidney Herbert, the Barrack and Hospital Improvement Commission have made inquiry and personally examined into the circumstances connected with the occurrence of fever among the recruits of the guards in the barracks at Croydon, and into the alleged connexion of a manure manufactory in the vicinity of the barracks with the appearance of this fever, and they now have the honour to report the result, briefly, as follows:—

The returns made to the commission by the medical officer in charge, show that between the 1st August and 8th October, ult., there were 18 cases of fever and two deaths among the recruits, out of a mean strength of 239; that the proportion of attacks was much higher among the grenadiers than among the other detachments, and that the two deaths likewise took place among them. The fever is described as a simple gastric continued fever, which passes into typhoid fever, after being eight or ten days in hospital, while among the cases which recover the convalescence is very tedious and the men return to health very slowly.

From inquiries made in Croydon itself, it appears that during the same period there were a number of cases of fever in the town, and that nine deaths were registered from typhoid, typhus, and bilious remittent fevers. There was at the same time a considerable amount of sickness over the district in which the barracks are situated, proving that the troops were not the only sufferers.

It is necessary here to mention that the present fever is by no means the only epidemic disease which has prevailed in these barracks. They have frequently been affected before, and scarlet fever prevailed in them to some extent during the last spring and summer, from causes similar to those now existing.

With this brief statement of the facts, we proceed to describe the causes:—

1. The ground occupied by the barracks is very low, and its means of drainage most defective. The whole district, except the higher parts of Croydon, is exposed to the influence of wet undrained land, and

the site occupied by the barracks is on that account alone objectionable. So strongly was the commission impressed with this fact, that in their report on the metropolitan barracks of 8th June ult., they recommended the removal of the whole establishment, rather than to incur the cost of rebuilding it in a healthy manner, a recommendation, the propriety of which has been further confirmed by what has just taken place.

2. At a distance of about 200 yards from the barracks is situated the outlet for the whole sewage of Croydon, which passes into a covered tank, where it is filtered, and from which it flows into open shallow reservoirs to be deodorized by charcoal and converted into manure. The process gives rise to great nuisance, as the prevailing winds blow over the place towards the barracks, and the faint sickly odour proceeding from it can be detected all over the barracks. There has been so remarkable a coincidence between the degree of direct exposure of different barrack-rooms to the air moving from this nuisance and the proportion of attacks of fever among the men, that we cannot escape from the conclusion that this manure manufactory has been an instrumental cause in predisposing to the fever. There is besides another similar nuisance in a line between the manure manufactory and the barracks, which has no doubt added to the evil. It is a large pig-sty, where pigs are fed on slaughter-house offal, from which offensive effluvia proceed, but to a very inferior degree as compared with those from the manufactory.

3. Besides these external causes of disease, there are other causes within the barracks themselves, which were described in our former report alluded to. The two fatal cases of fever did not occur in that part of the barracks most exposed to the nuisance, but in one of the No. 4 shed barrack-rooms, each of which has 38 men in it. The flooring of these sheds is laid on the damp subsoil, without any ventilation below, and the rooms were, moreover, much overcrowded, and they were still unventilated at the time we examined them on the present inquiry.

The ventilation recommended by the commission, in its report referred to, is now being carried out in the other barrack-rooms, but no reduction in the numbers of men has yet taken place in these rooms. The total number of recruits in barracks has been reduced, but this has been done by evacuating rooms. The large barrack-room, where the two fatal cases occurred, has been emptied, a step of which we entirely approve, and two men have been removed out of each of the thirty-eight-men rooms, but the numbers in the other rooms remain as they were.

The causes, then, which, in our opinion, have predisposed the men to fever, are—1. Low damp locality. 2. Impure air from nuisances. 3. Overcrowded rooms. 4. Defective ventilation. There is yet another important cause—not of the attacks of fever, but of their course and termination, which we cannot pass over—and that is the state of the hospital into which the men are received. The commission pointed out in their former report the very defective condition of this building; to which they have now to add, that being directly exposed to the winds blowing from the nuisances referred to, the fever cases brought from the barrack-rooms are perhaps more exposed to the emanations in the hospital than they were before their removal there.

We found lingering cases in hospital of seven or eight weeks' duration, of which the first symptoms had been very mild, and by no means indicating so long a period of convalescence. All the cases of typhoid had become so in hospital, after having been a certain time there. The position and structure of the hospital itself have, therefore, been influential causes in the course which the fever has taken.

In regard to the precautionary measures required, the commission have little to add beyond what they formerly stated.

1. The sooner another barrack for drilling the recruits of the guards is provided, the better. A similar remark applies to the hospital.

2. In the meantime, they would recommend an order to be issued for completing the ventilation in No. 4 barrack, for lime-washing all the barrack-rooms, and for allotting in every barrack-room 600 cubic feet of space per man. To do this, it will be necessary to remove four men out of every twenty-men room. Ten men must be removed out of every twenty-eight-men room, and nine men out of every thirty-eight-men room. Two men must also be removed out of the ten-men rooms.

3. The manure manufactory, or "filter house," as it is called, has been long a cause of nuisance and of complaint in the town. Its removal has been determined on for some time; and, on inquiry, the commission has been informed by the surveyor to the Local Board of Health of Croydon that the authorities "are now "rapidly constructing filter works at a more distant "spot, which I hope will be completed about "Christmas next."

The commission would nevertheless recommend that an official notice be sent to the clerk to the Local Board of Health from the War Department, to expedite the works; for if the present nuisance is continued by the authorities, and the troops are to be kept in these barracks, it may become necessary to take legal proceedings for compelling the abatement of the nuisance.

4. The commission would also recommend that complaint be lodged with the Clerk to the Local Board of Health as to the nuisance from the pig-sty, in order that the same may be abated. Evidence of nuisance in both cases can be obtained from the barrack-serjeants and others.

*Lastly.*—With regard to the hospital. It is altogether unfit for the treatment of fever cases. And the commission would advise that the medical officer have placed at his disposal a suitable barrack-room for the reception of his sick, until the fever ceases in the locality.

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## WOOLWICH.

SIR,

HAVING inspected and made inquiry into the condition of the barracks and hospitals at Woolwich, we have the honour to lay before you the following Report:—

The royal artillery barracks at Woolwich stand at the northern end of the sloping ground which lies between the foot of Shooter's Hill and the town of Woolwich.

On the north side the barrack buildings are close to the town; on the south side they are open to Woolwich common.

The site is elevated about 122 feet above high-water mark, at a distance of three-quarters of a mile from the river. The soil generally is a mixture of sand and gravel.

The barracks are substantially built of brick; they were erected at various periods between 1801 and 1809, but several considerable additions have been made to them within the last few years.

The hospital is placed on the eastern slope leading down to the town.

The establishment covers an area of about 19 acres. Together with the huts on Woolwich common, the barracks are capable, under the present regulation, of containing 4,822 men.

They consist of a long front range of buildings facing the south, divided in the centre by an archway.

In rear of each division of the front range stands a large square for the horse artillery, and between the squares and the front range are placed staff serjeants' quarters, the gymnasium, &c.

Behind each of the squares there is placed a long range of barracks for the field batteries.

The barrack-rooms in the front range are constructed with a basement, a ground floor, and two stories above; those over the stables in the square

are one story high, and each of the rear ranges consist of two stories over the stables. The rooms in the basement of the front range are not suitable for barrack-rooms. Basements ought always to be avoided for sleeping-rooms, and no barrack ought to be constructed with basements intended for such a purpose. They are always more or less damp, dark, badly ventilated, and unwholesome.

The rooms, with the exception of those on one side of the squares, are placed back to back, and a staircase and passage afford access to the rooms on each floor.

The rooms are constructed to contain from 12 to 24 men each, with a cubic space of from under 300 to above 700 cubic feet per man.

The following Table shows the contrast between the present regulation accommodation in the royal artillery barracks and what it would be at 600 cubic feet per man :—

| Situation. | Number of Rooms. | Present Number of Men per Room. | Cubic Contents of each Room. | Cubical Space per Man. | Total Number of Rooms. | Total Number of Men. | Men per Room at 600 Cubic Feet per Man. | Total Number of Men in Rooms at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|---|---|---|---|---|
| First Floor. East Square. Basement. | 1, 2, 42, 43, 70, 71 - | 12 | 3523·7 | 293·7 | 6 | 72 | 5 | 30 | 42 |
| | 3, 4, 30, 31, 44, 45, 74, 75 | 12 | 3464·11 | 288·8 | 8 | 96 | 5 | 40 | 56 |
| | 14, 15, 16, 17, 58, 59, 60, 61 - - | 12 | 3464·11 | 288·8 | 8 | 96 | 5 | 40 | 56 |
| Ground Floor, Front Range. | 5, 6, 18, 19, 20, 21, 22, 23 | 12 | 5690·3 | 474·2 | 16 | 192 | 9 | 144 | 48 |
| | 48, 49, 62, 63, 64, 65, 78, 79 - - | 12 | | | | | | | |
| | 46, 47 - - - | 24 | 11112·6 | 463·3 | 1 | 24 | 19 | 19 | 5 |
| | 80, 81 - - - | 12 | 5808·4 | 484·4 | 2 | 24 | 10 | 20 | 4 |
| | 50, 51 - - - | 24 | 11112·6 | 463·3 | 1 | 24 | 19 | 19 | 5 |
| First Floor. West Square. Front Range. | 7, 36, 37, 84, 85 - | 12 | 5338·7 | 444·10 | 5 | 60 | 9 | 45 | 15 |
| | 35, 52, 53, 66, 67, 68, 8, 9, 22, 23, 24, 25, 34, 69, 82, 83 - | 12 | 5205·5 | 433·9 | 16 | 192 | 8 | 128 | 64 |
| West Square. North Side. | 90, 91, 92, 93, 94, 95 - | 19 | 7084·6 | 372·10 | 6 | 114 | 12 | 72 | 42 |
| | 96, 97, 98, 99, 100, 101 | 23 | 7084·6 | 308·3 | 6 | 138 | 12 | 72 | 66 |
| West Square. South Side. | 102, 103, 106, 107, 110, 111, 114, 115, 118, 119, 122, 123 - | 19 | 9125·0 | 480·3 | 9 | 171 | 15 | 135 | 36 |
| | 104, 105, 108, 109, 112, 113, 116, 117, 120, 121 - - - | 16 | 7984·5 | 495·3 | 10 | 160 | 13 | 130 | 30 |
| East Square. North Side. | 151, 153, 154, 155, 156, 157, 158, 159, 160 - | 19 | 7084·6 | 372·10 | 9 | 171 | 12 | 108 | 63 |
| East Square. South Side. | 129, 132, 133, 136, 137, 140, 141, 144, 145, 148 - - - | 19 | 9211·0 | 484·9 | 10 | 190 | 15 | 150 | 40 |
| | 130, 131, 134, 135, 138, 139, 142, 143, 146, 147 | 16 | 7824·8 | 489·6 | 10 | 160 | 13 | 130 | 30 |
| First Floor. West Rear Range. | 161, 162, 167, 168, 169, 170, 175, 176, 177, 178, 183, 184, 185, 186, 191, 192, 193, 194, 199, 200, 201, 202 - - | 20 | 11552·4 | 585·8 | 22 | 440 | 19 | 418 | 22 |
| First Floor. East Rear Range. | 207, 208, 209, 210, 215, 216, 217, 218, 223, 224 - - - | 20 | 11715·0 | 585·8 | 10 | 200 | 19 | 190 | 10 |
| Riding House. | 226 - - - | 17 | 9621·0 | 566·0 | 1 | 17 | 16 | 16 | 1 |
| | 227 - - - | 17 | 9751·7 | 573·7 | 1 | 17 | 16 | 16 | 1 |
| Second Floor. Front Range. | 54, 55 - - - | 24 | 8395·0 | 349·9 | 1 | 24 | 14 | 14 | 10 |
| | 10, 11, 12, 13, 26, 27, 28, 29, 38, 39, 40, 41, 56, 57, 70, 71, 72, 73, 86, 87, 88, 89 - | 12 | 4000·0 | 333·4 | 22 | 266 | 7 | 154 | 112 |
| Second Floor. West Rear Range. | 163, 164, 165, 166, 171, 172, 173, 174, 179, 180, 181, 182, 187, 188, 189, 190, 195, 196, 197, 198, 203, 204, 205, 206 - | 20 | 15170·0 | 758·10 | 24 | 480 | — | 480 | — |
| Second Floor. East Rear Range. | 211, 212, 213, 214, 219, 220, 221, 222, 225 - | 20 | 15170·0 | 758·10 | 9 | 180 | — | 180 | — |
| | | | | | 213 | 3,508 | — | 2,750 | 758 |

The total accommodation, according to the existing regulation, in the 213 barrack-rooms in this Table, is for 3,508 men. In 180 rooms there is an excess of 758 men over the available space at 600 cubic feet per man. In the last 23 rooms in the Table there is no excess. The 213 rooms would, therefore, accom-

modate 2,750 men, giving 600 cubic feet to each, instead of 3,508, the present regulation number, showing a deficiency of accommodation for 758 men.

There is a fireplace in each room, placed at the end opposite to the door, and for each room there are generally three windows; there are also rooms with one, four, and six windows each.

The rooms are constructed on what is called the back-to-back principle, that is, there are two rooms in the depth of the building, each room having windows only on one side, and no proper thorough draught.

There are louvred openings between the adjacent rooms, with the view of obtaining a freer circulation of air than the structure affords; but these openings are better away, as they only permit the foul air and noise of adjacent rooms to mingle.

The only means of ventilation in the barrack-rooms is by doors, windows, and chimneys. It is deficient in amount, and would be at once improved by the introduction of foul-air shafts, affording nine square inches of outlet area per man in the lower rooms, 10 in the first floor rooms, 11 in the second floor rooms, and 12 inches per man in the top rooms; these shafts should be placed in the ceiling at one corner of the room; they should be carried up above the roof and should end in a louvred turret. In order to avoid expense, the corner of the room selected to place them should be such that one opening through the roof would serve for the passage of the shafts of as many rooms as possible.

Inlets for the external air, affording seven square inches per man, with means of diffusing the current, should also be made near the ceilings of each room.

The privies for a portion of these barracks have been constructed with divisions and half-doors. This improvement ought to be extended to the others.

The ablution-rooms are of a good size, but additional basins are required. There are no baths in any part of the barracks; these should be supplied in the proportion of one bath for 100 men; the baths should be separated from each other by a partition or a curtain so as to afford privacy.

Generally, the only means of cooking in these barracks is by boiling. In some cases the men send out their dinners to be baked outside the barracks at their own cost.

In one of the cooking-houses behind the front range Captain Grant's cooking apparatus has recently been put up, and is liked by the men.

The apparatus consists of six boilers placed on each side of a central horizontal flue, at the end of which is a vertical oven heated by the superfluous heat. The cast-iron top, in which the boilers are set, answers to some extent the purposes of a hot plate; a great deal of heat is disengaged from the apparatus and lost, rendering the kitchen very warm, and the boilers have to be shifted so as to increase the amount of heat to which their contents are exposed.

The apparatus has, however, the advantage that it has enabled one of the cook-houses to be closed in the portion of the range where it has been established, and thus additional space has been provided where space is the first requirement. It is proposed to convert this cook-house into a bath-house, for which its situation renders it available.

As several arrangements for varying the soldiers' cooking are in use, or have been at our suggestion introduced on trial in different barracks, it would be premature to express any opinion as to which form of kitchen range is best until all have had a sufficient trial.

The dust or ash-pits are, several of them, close to the men's rooms. They are uncovered, and are in many places very offensive; they were particularly so at the time of our visit. In cleansing them generally only the matter at the surface is taken away, while the lowest and most offensive stratum of their contents is very seldom removed regularly, so that nuisance often arises from them.

This remark applies to the whole of the ash-pits we have seen in barracks, and we think that in Woolwich barracks, where the space is so occupied, and where there are of necessity so many ash-pits, iron carts should be provided to receive the refuse; to be removed every day, or at most every alternate day.

The number of carts must of course be determined by the amount of refuse at each place; if there is sufficient to fill a good sized cart every day, it would be desirable that it should be removed daily, and that a duplicate cart be left empty while the full cart is being removed. If they are to be removed on alternate days one extra cart for two carts in use would be sufficient. If the service were properly organized, one or two extra carts only would be required, for the full carts could be removed at different hours in the day, emptied, and brought back to replace other full carts removed. These carts should be supplied by the Government and removed by the contractor.

### *Barrack Squares.*

The barrack-rooms in the squares for the horse artillery are over the stables, and consequently a certain amount of smell from the stables penetrates into the rooms. It is very expensive in existing buildings to make the floor impervious to this smell; and if there be not free ventilation for the stables besides the stable windows, the effluvia which escape by these windows will pass up outside and enter the barrack-rooms above by their windows and ventilators.

For these reasons we think that the best way of preventing the effluvia in the stables from acting injuriously on the men in the barrack-rooms above, is to carry one or more shafts, giving an area of 12 square inches for each horse, from the ceiling of the stables above the roof. Means of admitting fresh air to the stables through perforated panes or such other inlets as may be found most convenient, should at the same time be provided.

The barrack-rooms above the stables are low; on one side of the squares the rooms run through and have windows on each side, on the other there is a central wall, and the rooms have windows on one side only. In consequence of some decay having been discovered in the roof of these barracks, it is intended to renew the roof, and the Commanding Royal Engineer has obtained authority to execute a portion of this service this year. He proposes to take the opportunity of raising the ceilings and heightening the rooms: indeed in the new roofs the principals of the roofs are to be exposed, and he proposes to give ventilation by louvred turrets in the ridge.

Inlets for air would also be required, and these should be placed close to the eaves of the roof.

As the specification for this service has been drawn, we do not think it desirable that the proposed system of ventilation should be altered, but we think it is well deserving of the consideration of the Commanding Royal Engineer, whether in raising the roof of the other portion, shafts would not afford a more efficient system of ventilation, provided the rooms be ceiled, though we are of opinion that the sloping roof tends to promote ventilation, provided there be an outlet at the ridge. We do not think it is desirable to interfere with these rooms until the roof is raised.

The privies and urinals in the squares are too small; they are situated under the barrack-rooms, in the same passage as the lavatories, and are very offensive. These privies and urinals, in our opinion, should be removed altogether, if space could be obtained for them elsewhere. They should never be placed under barrack-rooms. It appears, however, that there is no available locality in which they could be reconstructed, and every means should therefore be adopted to prevent the effluvia from them passing upwards to the barrack-rooms. With this object we would recommend that the ceilings of the privies be covered throughout with sheet zinc; that ventilating

shafts, with as large an area as possible, be carried up from the privy ceiling above the roof of the building; that each privy be reconstructed as a water latrine, with drainage, and flushed twice daily; that more light be supplied to the privies; that all the room doors opening into the passage above be bricked up; and that a door be opened from the gallery on each side the passage, to afford access to the two front rooms; and that the back rooms have each a door from the front room. This arrangement will enable the upper lobby to be converted into a lavatory or bath-room, without the air of the rooms suffering from damp, as the walls of the passages are carried up to the roof. When the present doors are built up, and others opened to the external air, the effluvia from the privies in the lower floor of the passage will be cut off from the atmosphere of the barrack-rooms. The privies should be supplied with divisions and half doors. The urinals should be separated from the privies, supplied with water, and provided with divisions.

The space at present occupied by these privies and urinals, if they could be removed, might be advantageously used for extending the lavatories, and providing bath-rooms.

The privies are generally flushed with water, but it did not appear that the arrangements allow of the water always standing in the trough of the latrine, which is indispensable for preserving the buildings in a good sanitary state.

In all privies constructed to be flushed, the water should stand permanently in the trough and be let off once or twice a day as required, and as soon as it has been let off, a fresh supply should pour in until the trough is full.

*Ranges.*

The ranges at the back of the squares occupied by the field batteries consist of stables, over which are two floors of barrack-rooms; each staircase gives access to eight rooms on a floor; the rooms are placed back to back, and the rooms adjacent to the staircases form passages to the rooms inside; these rooms, as well as the stables, all require ventilation by shafts and inlets for air in the manner already described.

The cook-house requires means of roasting or baking meat.

The ablution-rooms of the ranges are a long way from some of the barrack-rooms. There are no baths.

The privies of the ranges require divisions and half-doors, and the water should stand in the troughs, as already mentioned, and the urinals should be divided and supplied with water.

The barrack-rooms occupied by the riding department are in great want of ventilation by shafts and inlets for air, and if possible additional windows should me made so as to give more light.

A large manure heap near this place is stated to be occasionally very offensive.

The urine tubs in all the barrack-rooms are much complained of. We shall be ready to recommend the discontinuation of urine tubs, so soon as the best form of urinal shall have been determined by experience at present in progress.

Woolwich has been drained under the Public Health Act, and these barracks are mostly drained into the town sewerage.

There are no day-rooms for the men.

There is no laundry.

There are no cleaning rooms.

There are three covered sheds for drill.

The usual workshops for the royal artillery are provided.

Water is obtained from the Kent Waterworks Company, and is said to be abundant in quantity.

All the guard-rooms require additional ventilation through the roof.

The cells and lock-up places are very small, and some of them were much overcrowded at the time of our inspection.

Certain rooms in the basement of the front buildings have to be appropriated for prisoners, and these too were greatly overcrowded.

Additional and larger accommodation for prisoners appears to be required, and great attention should be paid to the ventilation of all these lock-up places.

It would be much improved by air shafts carried up to the roof, as we have advised, for the barrack-rooms and inlets for air.

There is a ball court, but, being uncovered, it is not available in rainy weather when it is most wanted.

The library of the gunners and that of the non-commissioned officers is in the front range; they are both small for the large number of men in the barracks, and ventilation should be supplied to them of the same description as that already described. There is none at present, although the rooms are lighted with gas and often crowded with men.

Most excellent schools have been recently constructed for the garrison. They are well placed, light, and well ventilated.

From the preceding statement it will be gathered that the chief sanitary defects in Woolwich barracks are overcrowding, defective ventilation, defective state of the privies, urinals, and ash-pits, want of sufficient means of varying the cooking in most of the kitchens, want of baths, defects in the lavatories, and unnecessary retention of stable dung in the squares and ranges.

*To remedy these Defects we would recommend:—*

1. Reducing the numbers of men in the rooms, to give, as near as may be, 600 cubic feet per man, in conformity with the preceding Table.

2. Ventilating every barrack-room, guard-room, lock-up, and library, by shafts and inlets, for fresh air, as already pointed out.

3. Improving the privies and urinals under the barrack-rooms in the squares, in the manner pointed out; and improving the tanks of all the privies, so that water may stand in them to a constant level, also providing divisions of seats and half-doors where practicable.

4. Abolition of ash-pits and substitution of iron-carts for the frequent removal of refuse, in the way pointed out; also more frequent removal of stable dung.

5. Introduction of roasting ovens into the kitchens, not yet supplied with apparatus for varying the cooking.

6. Provision of baths in the proportion of one bath for every 100 men. Lavatories to be improved.

7. Stables to be ventilated as pointed out, to prevent as far as practicable the passage of effluvia into the rooms above.

It would be very desirable to provide day-rooms for the men.

*Hut Barracks.*

These barracks are situated on Woolwich common. They consist of 42 huts, arranged in streets running at right angles: with the necessary offices, and four huts for hospital purposes. They are constructed of wood and of corrugated iron. Each hut contains 24 men, with an average cubic space of 285 feet per man.

Although, in our opinion, detached huts are more healthy than permanent barracks, and require less cubic space per man, we still consider that there are too many men in these huts, and we think it would be very advisable to reduce the numbers from 24 to 20 men per hut, which would give about the same cubic space per man as is afforded by the hut barracks at Shorncliffe.

These huts are ventilated at the ridge, and a good plan of warming the air has been recently introduced by making it enter the room through a brick wall compartment behind the fire-grate. A ventilating shaft is also introduced alongside the chimney. The

plan is well worthy a trial. The latrines of these huts are good, but they are not sufficiently lighted, and would have been better placed at the outskirts of the camp.

The kitchens have no means of cooking except by boilers. An oven is required in each kitchen for roasting meat. The lavatories require gratings for the men to stand on. The lavatory tables are of wood, and not in a good condition. If these huts are to be continued in use, tables of slate should be substituted.

There are no baths. One should be provided for every 100 men.

The *hospital* consists of four men's huts set apart for sick. They are close to the latrines, and to the ash-pit and dung-heap. It would be much better to provide a proper hospital, and restore the huts to the men.

*The chief Sanitary Improvements required for these Huts are thus:—*

1. Reduction of numbers to the extent specified.
2. Providing a roasting oven for each cook-house.
3. Providing gratings for the men in the lavatories.
4. Baths in the proportion of one bath to every 100 men.

Arrangements should be made for the more frequent removal of manure from the stables, and for the collection and daily removal of other barrack refuse.

### Royal Artillery Hospital.

This building consists of one long range, with another joined to it at right angles at the middle. It stands on the slope of the hill, considerably lower than the barracks.

It contains 72 wards, having access from central passages and corridors. Several of these passages are gloomy, and have no independent means of light or ventilation, and when the outer doors are shut, the only light and air they receive comes through windows on pivots over the doors, communicating with the wards on either side of the passages.

The following Table shows the present regulation accommodation for sick in the royal artillery hospital, as compared with the accommodation at 1,200 cubic feet per bed :—

| Situation. | Number of Ward. | Present Number of Men per Ward. | Cubic Contents of each Ward. | Cubical Space per Man. | Total Number of Wards. | Total Number of Men. | Men per Ward at 1,200 Cubic Feet each. | Total Number of Men in Wards. | Deficiency of Accommodation in Beds. |
|---|---|---|---|---|---|---|---|---|---|
| Ground Floor | 1 to 10 | 6 | 3513·0 | 585·6 | 10 | 60 | 3 | 30 | 30 |
| | 11 | 12 | 8835·11 | 736·4 | 1 | 12 | 7 | 7 | 5 |
| | 12 | 14 | 12075·0 | 862·6 | 1 | 14 | 10 | 10 | 4 |
| First Floor | 13 to 22 | 6 | 4812·9 | 802·1 | 10 | 60 | 4 | 40 | 20 |
| | 25 to 32 | 6 | 4932·0 | 822·0 | 8 | 48 | 4 | 32 | 16 |
| | 57, 58, 61 | 6 | 4873·8 | 812·3 | 3 | 18 | 4 | 12 | 6 |
| | 62 | 6 | 3511·9 | 585·3 | 1 | 6 | 3 | 3 | 3 |
| | 59, 60 | 4 | 2582·6 | 645·7 | 2 | 8 | 2 | 4 | 4 |
| | 23 | 12 | 10372·6 | 864·4 | 1 | 12 | 9 | 9 | 3 |
| | 24 | 14 | 14175·0 | 1012·6 | 1 | 14 | 12 | 12 | 2 |
| Second Floor | 33 to 37<br>41 to 45 | 6 | 4637·2 | 772·10 | 10 | 60 | 4 | 40 | 20 |
| | 39, 40 | 6 | 4756·9 | 792·9 | 2 | 12 | 4 | 8 | 4 |
| | 38 | 10 | 6545·0 | 654·6 | 1 | 10 | 5 | 5 | 5 |
| | 48 to 56 | 6 | 4752·0 | 792·0 | 9 | 54 | 4 | 36 | 18 |
| | 63, 64, 67, 70, 71, 72 | 6 | 5316·9 | 886·1 | 6 | 36 | 4 | 24 | 12 |
| | 68, 69 | 6 | 3871·0 | 645·2 | 2 | 12 | 3 | 6 | 6 |
| | 65, 66 | 4 | 2777·4 | 694·4 | 2 | 8 | 2 | 4 | 4 |
| | 46 | 12 | 10756·8 | 896·4 | 1 | 12 | 9 | 9 | 3 |
| | 47 | 14 | 14700·0 | 1050·0 | 1 | 14 | 13 | 13 | 1 |
| | | — | — | — | 72 | 470 | — | 304 | 166 |

This table shows that there is space for no more than 304 beds, instead of for 470, the present number, so that there are 166 more beds in the hospital than there should be.

The basement of the building is not well lighted. It is appropriated to stores, itch and small-pox wards, baths, and other offices.

Although the hospital is constructed for 470 beds, under the present regulation as to space there were, at the time of our visit, 529 patients requiring treatment, and there was great overcrowding in consequence.

The ventilation is very insufficient; it is effected by a moveable fanlight over the doors of most of the wards, by windows in others, opening into the corridor; each ward generally has one window to the outer air opposite the door, and two air-brick openings near the ceiling.

The corridors, lobbies, and staircases all require ventilation; in the former by shafts and inlets, the latter by ventilators in the skylights.

The wards mostly are constructed for six patients, but there are others for 10 and 14 sick. Nearly all the wards are deficient in light and window space.

There are two bath-houses with a plunge bath in each; hot water is supplied to one of them only, for itch patients. A boiler is required for the other bath-room. Slipper-baths, with hot water from the kitchen, are the only means of supplying the other patients with bathing accommodation. Baths and lavatories, with hot and cold water, are required on each flat.

There are two sinks lined with lead, and supplied with water in each corridor, but there are no proper sculleries or nurses' rooms.

These sinks at present are the only means for ablution for the sick, there being no room or other convenience for this purpose in any part of the hospital.

There are self-acting water-closets and urinals opening out of every corridor, in buildings projecting beyond the body of the hospital; they are ventilated, and do not appear to give rise to smell.

The kitchens are large and convenient, and are supplied with boilers, ovens, and hot plates.

There is no laundry. The pack store consists of three dark rooms in the basement.

The washing is done out of the hospital.

The linen store is too small.

There is no drying apparatus, or room for airing linen, an essential convenience in all hospitals.

The room for the hospital guard is inconveniently placed within the building, and adjoining the wards appropriated to sick prisoners. These wards are low, dark, imperfectly ventilated, and very unsuitable for the reception of sick men.

A guard-room outside near to the entrance has been proposed, and more suitable sick accommodation for prisoners is certainly required.

We are decidedly of opinion that none of the basement wards facing the north are fit for this purpose at all. The wards facing the south are somewhat better, and might be used for the present; but they ought not to be occupied for sick longer than is necessary to provide other accommodation.

Gas is used in the passages, but the lights are stated to be insufficient, and the wards are very inadequately lit by tallow candles. It would be a great improvement to introduce a properly ventilated gas burner into each ward.

The drainage and water supply are stated to be sufficient.

Most part of this hospital is old, the site objectionable, and the accommodation for the increasing strength of the garrison insufficient. It is also wanting in several necessary conveniences which could not be supplied without further encumbering an already circumscribed site, which affords, at present, only two small yards for exercise, or by reducing the present inadequate accommodation for the sick, by misappropriating sick wards for the purpose.

It will be seen from the table already given that the regulation cubic space for sick is too small, and that in all the wards a large reduction of numbers will be necessary.

All the wards require ventilation by means of shafts led up from the angles of the ceilings through the roof, giving an area of 12 superficial inches of ventilating space per man for the lower rooms, and 14 square inches per man for the upper rooms.

Inlets for air should also be provided from the outer air, giving about 10 square inches per man of opening; the air to be diffused by means of perforated zinc or wire gauze. The ventilators must be capable of being opened or closed as required by the medical officer, and of being locked in the position he determines to be most desirable.

There should also be an arrangement for admitting air into the passages so as to be warmed by a stove, or behind the fireplace in a chamber of fire brick, from which it would pass into the passage, and from thence into the wards by inlets to be *always* open. This supply of air should be resorted to when the weather is too cold to allow of its being admitted direct from the outer air.

In the wards for convalescents the windows do not open at top; this defect should be remedied.

There are privies and urinals out of doors adjoining the exercising ground behind the hospital, which are in a disgraceful condition. Although a flushing apparatus has been provided, it appears never to have been used.

Improved water latrines with water tanks, divisions of seats, half doors and proper ventilation, are required, and urinals with slate divisions, and provided with water, should also be erected.

There is no day-room for convalescents.

The position, construction, and accommodation for sick in this hospital are all defective, and it is in great need of internal painting, whitewashing, and cleansing.

We are glad to learn that the question has been entertained of providing another hospital for this large and increasing garrison. It would be less expensive to do so than to make the extensive alterations required to render the present building suitable for sick.

A more airy and better site, sufficiently near the barracks for such a building, has been proposed; and in our opinion the best arrangement would be to erect a new hospital of proper construction and to convert the existing hospital into additional barrack accommodation for the growing requirements of the royal artillery. If this course were adopted, it would be necessary to increase the light in many of the rooms by opening additional window space.

The site alluded to for a new hospital is near the quarters of the Commanding Royal Engineer, and would form a good site for this purpose if sufficient in area.

In the event of the subject being further considered, we should be glad to lend our aid respecting the plans. In the meantime we should recommend the following improvements to be carried out in the hospital in order to meet the more immediate requirements for health.

1. Ventilation of all the corridors, passages, staircases and wards, in the manner pointed out. These improvements would be equally available if the building should be eventually turned into a barrack. Two additional windows to be made for each of the large end wards. A ventilated gas burner to be introduced into each ward.

2. Reduction of numbers of sick to the extent pointed out in the preceding table, and the provision of temporary hospital accommodation to supply the deficiency.

3. Making the windows in the convalescent wards to open at top.

4. Accommodation for sick prisoners to be restricted to wards facing the south.

5. Better lavatory and bath accommodation near the wards, by appropriating a small ward on each flat for the purpose.

6. Privies in the court behind the hospital to be converted into water latrines with suitable means of flushing.

In this hospital the very objectional custom prevails of the orderlies sleeping in the wards with the sick. It would be very advisable to make some arrangements by which this could be avoided, if practicable.

We have the honour to be, &c.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission.*

*October* 4, 1858.

# CHATHAM DISTRICT.

Sir,

In compliance with our instructions, we have the honour to transmit the following Interim Report on the barracks and hospitals at Chatham and Brompton:

We have examined and inquired into the sanitary condition of the following barracks and hospitals at this station, and shall report on them separately:—

1. Chatham Barracks.
2. Spur.
3. Chatham Garrison Hospital.
4. Fort Pitt (Upper) Hospital.
5. „ Casemated Hospital.
6. „ Lunatic Hospital.
7. Brompton Barracks.
8. „ Hut Barracks.
9. St. Mary's Casemates.

## 1. CHATHAM BARRACKS.

These barracks, which occupy an area of about 12 acres, are situated on the slope of a hill, at some elevation above the river Medway. Their position generally is open and airy, and there is no local peculiarity in the site which ought to render it unhealthy.

The soldiers' barracks occupy the lower part of the hill-side. Above them is the parade ground, and higher than the parade ground are the officers' quarters.

The barracks are built in three parallel lines of blocks, running across the slope at right angles to its plane. Each line is about 30 feet from the line of building next below it. The front of each block looks upwards to the hill, and on account of the fall of the ground, the buildings are higher on their lower than on their upper side, a circumstance which renders the lower rooms in all the blocks unfit for being used as barrack-rooms. They are dark and damp, and in the two front ranges they are used for lavatories.

Each floor of every block of buildings contains two ranges of barrack-rooms built back to back, so that the rooms have windows only on one side; a thorough draft of air, so essential where rooms are crowded with men, is usually sought for, in barracks of this construction, by providing openings through the partitions dividing the two rows of rooms, but such an arrangement simply admits the foul air of one room to intermingle with the foul air of another room, without ensuring any corresponding advantage from the windows on the opposite sides of the building.

The access to the rooms is by wooden staircases and wooden landings, running the entire height of the blocks, with windows back and front. There are, in all, 176 barrack-rooms, with regulation accommodation for 2,700 men.

The dimensions of these rooms are very similar in the great majority of instances. 146 rooms are 27 feet 9 inches long by 19 feet 3 inches broad, and they vary in height from 8 feet 3 inches to 10 feet 4 inches. They are, for the most part, gloomy, dark, low, and encumbered with clumsy hanging shelves, which interfere with the circulation of air in the rooms.

Nearly all the rooms have three windows on one side, varying in height from 3 feet 5 inches to 4 feet 6 inches, and 2 feet 10 inches broad. In most cases this window space is insufficient.

Each room has a fire-place opposite the door. The chimney breast is generally 4 feet 3 inches above the floor, and about 4 feet wide. These fire-places are not well constructed, and the grates of some of them waste a large amount of heat.

The rooms are very much overcrowded.

In six rooms the number of men allotted by regulation gives only 294 cubic feet per man.

| | | | | |
|---|---|---|---|---|
| In | 3 | it is | 358 cubic feet | „ |
| „ | 56 | „ | 345 „ | „ |
| „ | 54 | „ | 281 feet | „ |
| „ | 20 | „ | 275 cubic feet | „ |
| In | 16 | it is | 285 feet per man. | |
| „ | 8 | „ | 247 „ | „ |
| „ | 3 | „ | 364 „ | „ |
| „ | 4 | „ | 325 „ | „ |
| „ | 3 | „ | 383 „ | „ |

In 3 rooms only does the space per man exceed 500 cubic feet, and these 3 rooms accommodate no more than 6 men.

The following table shows at one view the practical result of this overcrowding, as it affects the amount of barrack accommodation that would be at once required to enable us to set aside 600 cubic feet per man as recommended by the Royal Commission, and required by our instructions:—

| Number of Rooms. | Men accommodated according to present Regulation. | Men to be accommodated at 600 Cubic Feet each. | Number of Men for whom Accommodation is deficient. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 6 | 102 | 48 | 54 | 17 | 8 |
| 3 | 51 | 30 | 21 | 17 | 10 |
| 56 | 896 | 504 | 392 | 16 | 9 |
| 54 | 864 | 378 | 486 | 16 | 7 |
| 20 | 320 | 140 | 180 | 16 | 7 |
| 16 | 256 | 128 | 128 | 16 | 8 |
| 8 | 104 | 40 | 64 | 13 | 5 |
| 3 | 30 | 18 | 12 | 10 | 6 |
| 4 | 40 | 24 | 16 | 10 | 6 |
| 3 | 27 | 18 | 9 | 9 | 6 |
| 2 | 8 | 6 | 2 | 4 | 3 |
| 1 | 2 | 2 | — | 2 | 2 |
| 176 | 2,700 | 1,336 | 1,364 | — | — |

It hence appears that there is a deficiency of accommodation in Chatham barracks of upwards of 50 per cent.; so that the buildings would require to be doubled to hold the present number of men in them with security to health.

This great overcrowding is not compensated for either by the structure or ventilation of the buildings, and we are of opinion that nothing except the high exposed position of these barracks, and the comparatively short sojourn of the troops in them, preserves them from epidemic disease.*

There being no accommodation for staff-serjeants, or for the offices of so large an establishment, soldiers' barrack-rooms are misappropriated for these purposes, and the limited barrack accommodation is further reduced from this cause.

Every room was occupied at the time of our inspection at an average of 351 cubic feet per man, and a large number of recruits were daily expected, for whom space would have to be obtained in the same rooms.

The ventilating arrangements of the barrack-rooms are very defective. They consist of a sloping board inserted near the top of each window, leaving a space between the upper surface of the board and the lintel through which air can pass into the room when the window is drawn down at top. There is also a slide in the door that can be used to admit air from the staircases, and air is allowed to enter under the floor joists at the foot of the centre wall.

All the ventilating openings, except the last, are under the control of the men, who keep them closed when they most need being open, so that, in reality, the only means of ventilating these overcrowded rooms is by the fire-places.

All the barrack-rooms are lit with gas which is described to be a great comfort to the men; but it is not economical, on account mainly of wastage from the pipes, both above and below ground, and partly from want of care in the consumption. There are no means of removing the products of combustion of the gas from the atmosphere of the rooms.

* We are informed that scalet fever has broken out in these barracks since our inspection.

There is no day-room attached to these barracks. The men occupy the crowded sleeping rooms during the day, and they also take their meals in them. There is little chance of the rooms being thoroughly purified so long as these practices are allowed to continue. The walls and ceilings bear marks of want of due cleanliness. This appears to arise from no neglect of the barrack officers, but simply from the fact that proper purification of buildings occupied in the way these barracks are occupied is next to impossible.

The floors of a number of barrack-rooms are covered with asphalte, which is an objectionable material from being cold, and from retaining moisture on its surface.

There are day and infant schools, the former having accommodation for 550 scholars, a number which exceeds considerably the attendants.

There is a library and reading-room, containing 3,112 volumes. The privileges of this room are highly prized by the soldiers. During last year there were 5,776 subscribers. The room is about 40 feet long, 22 feet broad, and 11 feet high, showing, an amount of accommodation quite inadequate to the wants of the readers.

As already stated, the lavatories are placed in the ground floors of the two front ranges of buildings. They are 11 in number, each fitted up with 40 basins, and having water laid on. These rooms are only 7 feet 2 inches high; they are gloomy, damp, cold, not well ventilated, and certainly not suitable places for men to go and wash in immediately after leaving their beds. There is indeed one very good ablution-room belonging to the barracks; but as there is no proper meat store for issuing some 3,000 rations a-day, this room has been appropriated for the purpose. Each lavatory has a small bath, but there are no means of obtaining hot water for it, and the bath accommodation generally is inadequate for the purposes of cleanliness and health. There are no lavatories or baths for the women and children in the barracks.

The washing establishment at Chatham barracks is wholly inadequate for the requirements of so many officers and men.

The reconstruction of the laundry, with the now generally used improvements of steam, hot water, &c., has been recommended by the Commanding Royal Engineer, and ought to be done without delay. From the constant passage of men through the garrison, and the consequent large quantity of fresh and of new clothing and bedding issued to the troops, perhaps in a damp or imperfectly dried state, no station which we have visited requires a drying-room more than this.

Chatham barracks contain no separate accommodation for married non-commissioned officers, or for soldiers whose wives are allowed. Staff-serjeants have separate rooms, and pay-serjeants have either a room to themselves or a room between two. But in every barrack-room there is a married non-commissioned officer or private among 14 men, and not unfrequently girls from 14 to 16 years of age are inmates of barrack-rooms, mixed up with the soldiers.

Apart from the demoralizing tendency of such arrangements, the atmosphere of barrack-rooms is liable to deterioration from the occupations carried on by married people during the absence of the men for parade or other duties. Advantage is commonly taken of this by the women for unsavoury cooking, for washing, and for getting up linen. During these operations the doors and windows are diligently closed. The walls become impregnated with impurities from this source, and damp from wet or imperfectly dried linen being secreted until opportunity offer of getting it out of hand. Hence it arises that the soldier not unfrequently returns to a close, heated, and often noisome atmosphere, in which he probably passes the night. Nor is this all; curtains, double beds, accumulated clothes, and cooking utensils, perhaps children, further crowd the room, and deprive the others of their fair share of space and ventilation. The only remedy for an evil of such magnitude is to provide suitable married quarters, and to remove the women and children out of the barrack-rooms.

In 1856–57 a sum of money for erecting a block of buildings for married quarters was authorized, but as there was a difficulty about the site, the money was expended on a similar object at Brompton barracks. His Royal Highness the Commander-in-Chief has pointed out a site, but there are at present no funds for the building.

Until the end of last year the whole cooking in Chatham barracks was done in four kitchens, containing 56 boilers for making soup. The soldiers had been in the habit of sending their meat two or three days in each week into the town of Brompton to be baked, and for this change in cooking they voluntarily incurred an expense of 200*l.* per annum. About the beginning of the present year a suitable building with two large ovens was completed and is now in use.

Although these ovens do not afford all the improvements in cooking that might be desired, they are a very great convenience to the men.

There are no cleaning-rooms belonging to Chatham barracks; there are no covered sheds for drill, and the want of this accommodation is much felt. All the guards for Chatham garrison are paraded at the barracks, and recruits are being constantly drilled, in all states of the weather. When rains falls the men have to seek shelter where they can obtain it. The want of a suitable shed has been represented from year to year without result. But apart from duties and exercise, cover of this kind is required for the frequent filling of palliasses, which, in the constant movement of the troops, cannot wait for fine weather.

There are three tailors' shops belonging to the barracks. There is no available space for the erection of additional workshops, in which the soldiers' spare hours might be spent, although there are premises now otherwise occupied, which could be converted into suitable workshops if they could be spared.

The water supply for the barracks is derived mainly from the dockyard, whence it is pumped up by an engine to a tank above the level of the barracks.

The supply is insufficient for some most important purposes, as for instance, for flushing out privies, urinals, and drains. An additional supply is required, and could be obtained either from the dockyard, or by laying on water from the Water Company's works at hand.

The rapid fall of the ground towards the Medway affords great facilities for draining all the buildings. There are trapped sewers which descend the hill, and empty themselves into the river above low-water mark, and part of the drainage of the buildings is passed into these sewers; but there are cesspools in front of the blocks occupied by soldiers, in the second and rear ranges, which ought to be at once abolished, and the whole drainage improved.

The surface drainage between the blocks is not in very good condition, and the open gutters running along under the barrack-room windows are used for emptying the urine tubs. The latrines generally are defective in construction, and the water supply is too limited to admit of their being sufficiently flushed.

The urinals, especially those near the guard-rooms, are not in good condition, and require a supply of water to keep them clean.

The ash-pits are open and exposed, and apt to generate nuisances. Provision could easily be made for their abolition by collecting and removing the barrack refuse every day in suitable iron carts, one of which might be left for receiving the refuse of the day, removed when full, and replaced by an empty cart.

There is no proper accommodation for the dirty bedding or dirty hair stores, which are at present placed under the men's sleeping rooms, in two of the barrack buildings.

There are no drying-rooms for airing or drying the men's personal linen or bedding in damp weather. The beds and bedding are changed in certain days of the week without reference to the state of the weather, and to these defects the medical officer attributes much of the catarrhal and pulmonary disease prevalent in the barracks.

The ventilation in all the guard-rooms and lock-up places is defective, and there is a considerable degree of overcrowding in the latter. We are informed that when the lock-up rooms happen to be crowded with prisoners, the men break every pane of glass in them, in order to obtain air.

*The Main Guard* (men's room), is intended to contain 30 men under the regulations, a number which would allow only 175 cubic feet of space for each. It was occupied at the time of our inspection by 21 men, giving less than 250 cubic feet to each.

The officer's room attached to the main guard gives 1,627 cubic feet to its one inmate.

*Brompton Gate guard-room* contains, according to regulation, 16 men in a space giving 282 cubic feet per man. It was occupied when we inspected it by 11 men, at about 410 cubic feet each. The adjoining officer's room gives 1,848 cubic feet to its occupant.

*The Regimental guard-room* holds 10 men at 410 cubic feet each. At the time of our inspection it was occupied by eight men, at 513 cubic feet each.

The regulation number that can be placed in the lock-up rooms, if these rooms were fully occupied, would overcrowd them to a great degree.

*The Old Provost lock-up* is intended for 20 men, at 210 cubic feet each.

*The Main Guard lock-up* for 8 men, at 169 cubic feet each.

*The Brompton Gate guard lock-up* ought to contain 8 men according to regulation, at 169 cubic feet each.

*The Regimental lock-up*, No. 1, is intended for 20 men, at 287 cubic feet for each. Lock-up No. 2 is for the same number of men, with a similar amount of cubic space.

The cubic space in the prison cells is very much larger than in the lock-up rooms.

*The Old Provost cells* give 660 cubic feet for each prisoner.

*The Regimental cells* give 500 cubic feet per prisoner; but the 14 new provost cells give no less than 1,482 cubic feet per man.

On comparing these amounts with the cubic space given either in the barracks, hospital, or guard-rooms of Chatham garrison, we cannot but be impressed with the great advance which has taken place in improving the sanitary state of prisons when compared with the present accommodation of the soldier any where outside the prison walls.

The main evils in Chatham barracks are overcrowding and defective ventilation.

The lofty and exposed situation of the garrison, and the absence of those external impediments to a free circulation of air, which usually exist in town barracks, no doubt materially diminish the effect of the unfavourable circumstances mentioned on health. Most of the soldiers, moreover, are recruits, and do not remain above a few weeks in the barracks. The mortality, therefore, is by no means high, although the admissions into hospital are numerous, and the diseases which prove fatal already begin to indicate the influence of barrack life on the soldiers' health, by their greater proportionate mortality than among the class from which the soldier comes.

The average monthly strength for six years and eight months, from April 1st, 1851 to November 30th, 1857 was 2,810 men.

The admissions into hospital during the same period were 26,837, or in the ratio of 1,400 per 1,000 of the strength per annum.

There were 192 deaths during the same period being at the rate of 10·2 per 1,000 per annum.

The mortality of males in civil life between the ages of 15 and 25 is 8·1 per 1,000 per annum, showing an increase of mortality of above 2 per 1,000 per annum among the recruits.

About 9 per cent. of the admissions into hospital have been from fevers, cholera, dysentery, and diarrhœa; and about 23 per cent. of the deaths have been occasioned by these diseases.

Upwards of 43 per cent. of the mortality has arisen from phthisis. The proportionate mortality from this disease among males in civil life between the ages of 15 and 25, being 39·8 per cent. of the total mortality.

Catarrhal, pulmonary, and zymotic diseases are the chief causes of sickness in Chatham garrison; and out of 192 deaths within the period mentioned above, 127, or 66 per cent. were occasioned by phthisis, fever, cholera, dysentery, and diarrhœa; but, as already stated, the absolute mortality, and the relative mortality from these diseases, which are intimately connected with defective sanitary condition, would, in all probability, be much higher were it not for the airy position of the garrison.

As it is, the prevalence of those diseases from which the mortality mainly arises, indicates the extent to which the natural advantages of the situation are neutralized by want of regard to hygiène.

*The following are the requirements for Health for Chatham Barracks:—*

1. Reduction of numbers in every barrack-room, to give each man 600 cubic feet of space.
2. Ventilation of every barrack-room by a shaft carried up from the corner of the room opposite the windows to the roof, and admission of fresh air by means of a perforated wire gauze cornice between the windows.
3. Similar means of ventilation for the guard-rooms, lock-up rooms, schools, and library.
4. Reducing the numbers in the guard-rooms, so that every man *constantly* in the room shall have 600 cubic feet of space.
5. Reducing the numbers on the schedule of the lock-up rooms from its present amount to the numbers usually in these rooms.
6. Limewashing the walls and ceilings of all barrack-rooms twice a year.
7. Boarding the asphalted floors.
8. Abolishing of cesspools and improving the drainage.
9. Additional water supply.
10. Reconstruction of latrines throughout the garrison with water receptacles, and suitable means of efficient flushing; and division of seats.
11. Urinals to be reconstructed and supplied with water.
12. Removal of foul bedding and hair stores from under barrack-rooms.
13. Better ablution-rooms to be provided for the men, and also for women and children.
14. Baths to be provided in the proportion of one bath to every 100 men.
15. Proper urinals to be provided for the barrack rooms instead of urine tubs.
16. Provision to be made by iron carts, one of which is left at the barrack while the other is being removed, for the daily collection and removal of all barrack refuse; abolition of ashpits.
17. A drying-room, with stoves for drying and airing men's linen, bedding, &c. to be provided.
18. Day-rooms to be provided, and suitable accommodation in the way of workshops.
19. Covered sheds for drill.
20. Reconstruction of laundry, with suitable means for washing and drying clothes, and bedding.
21. Construction of married soldiers' quarters.

With respect to the last of these requirements, we may add that the officers' quarters are of a very inferior description; the rooms are small, badly arranged, and unsuitable. They could be readily altered and improved in their sanitary condition and structure to render them fit for married soldiers' quarters, in which case new officers' quarters would have to be constructed.

## 2. SPUR BATTERY.

The barrack accommodation at Spur battery consists of 12 rooms, with regulation accommodation for 42 men, to which extent the rooms were occupied at the time of our inspection.

In two rooms there were eight men in each, with 412 cubic feet per man; these rooms would hardly contain six men in each at 600 cubic feet per man.

In one room there were six men where no more than five ought to be.

In one room there were six men where only four ought to be.

In two rooms there were four men in each in the cubic space for two men.

The upper casemated rooms are appropriated for invalided gunners or married soldiers; while the lower rooms, being considered ineligible for soldiers' quarters, are occupied by invalid soldiers and their families, or by married soldiers belonging to Chatham garrison.

There are no means of ventilation for any of the rooms except windows, doors, and chimneys.

There is one kitchen, with no means of cooking except by boilers.

The water is derived from a well.

The drainage is defective: it is merely led outside the works and there discharged.

The latrines are in bad condition.

Although these buildings have been for some time disused as barracks, they are still occupied by soldiers and by invalids, and any cause of unhealthiness in them will be prejudicial to both classes of men, especially to the latter.

The only thing that could be done with them, if they are to be continued in occupation, would be to improve the ventilation, drainage, &c., and to remove the invalids from them as soon as other accommodation can be provided.

It would be far better, however, to evacuate the buildings altogether on account of their general unfitness for human habitation, and to appropriate them as stores; and this latter course we would recommend as the least expensive to the public.

### 3. CHATHAM GARRISON HOSPITAL.

This hospital, originally constructed for the sick of the ordnance, has had several considerable additions made to its accommodation since its conversion to its present use. It now consists of two buildings, Nos. 1 and 2, situated in an open airy position, on the hill slope above the barracks. The main line of building faces east and west, and on each floor there is a range of wards and a corridor extending the entire length of the range. The wards are situated on the eastern side, and the corridor on the western side. The milder and warmer aspect of the hospital is thus protected by the corridors, whilst the colder side has no protection. The ranges of corridors communicate by stairs extending from the top to the bottom of the building, so that the entire ventilation of the hospital wards is common throughout.

There are 37 sick wards, exclusive of two for the separate treatment of itch patients.

The following table shows the extent of ward accommodation in this hospital:—

| Wards. | Present Number of Beds. | Number of Beds at 1200 Cubic Feet each. | Deficiency of Bed Space. |
|---|---|---|---|
| No. 1 Hospital. | | | |
| 1, 2, 3, 4, 8, 9, 10 | 42 | 21 | 21 |
| 13 to 32 inclusive | 200 | 100 | 100 |
| 33 to 37 inclusive | 30 | 15 | 15 |
| No. 2 Hospital | | | |
| 1 to 6 inclusive - | 60 | 36 | 24 |
| Total 38 | 332 | 172 | 160 |

The wards are low and confined. With six exceptions, they are only 10 feet 8 inches in height, and the remaining six wards are 12 feet high. Their length varies from 18 to 33 feet, and their breadth from 16 feet 6 inches to 19 feet 10 inches. All the wards in No. 1 hospital have only one window each, varying from 4 feet 6 inches to 6 feet 8 inches high. The six wards in No. 2 hospital have two windows in each. The whole structure resembles a series of cells, presenting great obstacles to ventilation, and the foul air of which can pass from one cell to the other by means of the corridors and staircases.

The ventilation, such as it is, is effected by two openings into the external air on the eastern side of each ward, and two openings into the corridor In all the wards except five, there is also a swing window over the door opening into the corridor.

Including 30 itch beds, there are 358 beds in these buildings, and each bed has, on an average, 596 cubic feet of space. In 12 wards the cubic space averages 527 feet per bed. In 20 wards there are 642½ cubic feet per bed, and in six wards the space amounts to 690 cubic feet per bed.

There is one fire-place and one gas-light for each ward, and there are three gas-lights in each corridor.

There are two lavatories, one for each building, but the lavatory accommodation is very deficient.

There are three bath-rooms, one of which belongs to the itch wards.

The bathing accommodation is deficient.

There is no laundry.

Each building has a cook-house, but the kitchen arrangements are very imperfect, and require reconstruction.

The provision store is too small. A store is required for soiled bedding, and also a medical store-room.

There is no suitable hospital accommodation for sick officers, for staff non-commissioned officers, or for women and children.

There is no room for divine service, and there is no waiting or reading-room for medical officers attached to the hospital.

The water supply is pumped up from the dockyard, and when any accident happens to the machinery, the hospital is frequently short of water.

The water-closets were being reconstructed on better principles at the time we inspected the buildings, but some were still very defective. The privies in the centre block had no water laid on, and were very offensive.

There are no urinals.

The enumeration of defects we have given will be sufficient to show the exceedingly defective plan on which this hospital has been built, and the want of knowledge it displays of the true principles of hospital construction. It cannot, except at very great expense, be so altered as to make it embody the present knowledge on the subject. All we should advise would be to remove the more obvious sanitary defects. Under any circumstances, it will be difficult to ventilate the wards satisfactorily, for the sick are ranged along the dead walls, instead of between the windows, so that the emanations from the sick must pass over all the beds before escaping either into the open air or into the corridors.

The very first improvement required, is reducing the number of sick, so as to allow, as nearly as may be, 1,200 cubic feet per bed. To effect this, it will be necesary to reduce the number of beds in wards 1, 2, 3, 4, 8, 9, and 10, in No. 1 hospital, from six to three in each ward, which would give 1,054 cubic feet per bed. To do this, 21 beds out of 42 in these seven wards will have to be removed.

In each of the wards 13 to 32, we would propose to place five beds instead of 10, the present number. This would give 1,284 cubic feet per bed. These 20 wards contain 200 beds, 100 of which will require to be removed.

Wards 33 to 37 have six beds in each, half of which we propose to remove, which would give 1,054 cubic feet each for the three remaining beds. Fifteen beds would have to be removed from these five wards.

In hospital No. 2 are six wards, 1 to 6, each containing 10 beds. by removing four beds from each ward, each of the remaining six beds would have 1,150 cubic feet of space. To effect this improvement 24 beds will have to be removed. The deficit of accommodation for sick in this hospital amounts on the present number to 160 beds, which, if removed, would give the remaining 172 beds (excluding the itch wards) 1,206 cubic feet of space on an average.

Besides the improvements more immediately required in Chatham Garrison hospital, it would be advantageous to the external circulation of air to remove a one-story building in the yard ; to convert the present guard-room into a dirty bedding store, and to provide another guard-room at the entrance gate. A larger and better lighted inspection room and dead house are required, and it would be an additional improvement to extend the hospital grounds by including in them the carriage way in the rear.

*The following are the Requirements for Health :—*

1. Reducing the number of beds as already stated.
2. Separate ventilation for every ward by a shaft carried up from the ceiling to the roof of the building, and by admitting fresh air by the existing ventilators, through partial cornices of perforated zinc, or wire gauze. The corridors also require ventilation.
3. Abolishing privies and imperfect water-closets, and reconstructing all water-closets efficiently.
4. Construction of urinals beside the water-closets.
5. Increased water supply.
6. Reconstruction of hospital kitchens, with the requisite means of cooking diets.
7. Construction of lavatories and bath-rooms for each division of the hospital.
8. A day and dining room to be provided for convalescents.
9. A covered walk or exercising ground for convalescents.

These requirements are in our opinion barely sufficient to remove the more obvious sanitary defects in Chatham Garrison hospital ; but, even if they were all carried out, the building would be by no means what it ought to be as a garrison hospital, where junior medical officers are expected to acquire a knowledge of the specialities of their department. The other desiderata enumerated equally require to be supplied.

## 4. FORT PITT (UPPER HOSPITAL).

This hospital consists of four blocks of wards, arranged in two lines, running from north-east to south-west. The blocks are 18 feet apart from each other, and the space between them in the middle is occupied by buildings, so that the whole hospital has the form of the letter H. On either side of this middle line of buildings is a small rectangular court, not open, but built across on the north-east side by structures connected with the hospital, and on the south-west side by a wall. The space between the blocks of wards, instead of being left open for thorough ventilation, is thus converted into two closed courts. The court, on the north-east side, is occupied by lavatories, baths, water-closets, and covered passages, leaving only a small square yard in the centre. The south-west court contains in its centre a large cesspool, which has not been emptied within the memory of anyone in the hospital. At one end of this court are the water-closets, which are drained into this cesspool, and at the other end are some very offensive open privies.

The hospital occupies high ground within the lines of Fort Pitt, on an area of about three acres. The ditches are deep, and there are no drainage outlets from the interior of the fort, so that all the filth and drainage of the establishment, except what is carted away at distant intervals from the privies, is allowed to percolate into the chalk.

The wards are arranged in pavilions, or blocks joined end to end, and have windows along the two opposite sides.

There are eight wards, each 59 feet long, and 22 feet 9 inches broad ; they are of different heights, four being 13 feet 8 inches high, and four 12 feet 8 inches high.

One ward is 23 feet 6 inches long, 19 feet 3 inches wide, and 12 feet 8 inches high. One ward is 34 feet 2 inches long, 24 feet 2 inches broad, and 9 feet 9 inches high ; and two wards are each 14 feet 10 inches by 13 feet 9 inches, and 12 feet 8 inches high. These two latter wards are only occupied in cases of emergency, and are used for patients requiring separation.

The eight larger wards have each nine windows ; the sills of these windows are 5 feet 2 inches from the ground, and the windows open at top only.

The two smaller wards have, one five and the other two windows, opening at top and bottom. The windows are some seven some eight feet high. Each of the larger wards has a fire-place at either end, and the smaller wards have one fire-place each.

In each of the eight larger wards are 27 beds, 25 for sick, and two for orderlies, arranged on opposite sides of the wards, between and under the windows. The beds are only 20 inches apart, and 9 feet 1 inch from foot to foot. The cubic space per bed in the four loftier wards is 678 feet, while in the other four wards it is 629 cubic feet.

The two smaller wards accommodate, one nine, the other 16 sick, with a cubic space per bed varying from 503 to 636 feet.

The following table shows the present ward accommodation at Fort Pitt hospital, in comparison with what it would be at 1,200 cubic feet per bed :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Space. | Present Number of Beds per Ward. | Proposed Number of Beds per Ward. |
|---|---|---|---|---|---|
| 2, 3, 6, 7 | 108 | 60 | 48 | 27 | 15 |
| 10,11,14, 15. | 108 | 56 | 52 | 27 | 14 |
| 12 - | 9 | 5 | 4 | 9 | 5 |
| 5 - - | 16 | 7 | 9 | 16 | 7 |
| Total 10 | 241 | 128 | 113 | — | — |

From the height of the ceilings of the wards, sufficient ventilation might be effected by open windows and fire-places, provided each bed had 1,200 cubic feet of space, and there are besides ventilating openings in the ceiling of each ward, covered by plates with a few round holes bored in them, communicating with the external air by hollow beams above the ceiling. In four wards there are 12 of these openings in the ceilings. In other four wards there are four each, and in each of the two smaller wards there are three each. If the numbers of beds cannot be reduced so as to afford 1,200 cubic feet per bed, the wards must be ventilated by shafts and inlets in the usual way.

The hospital is lit by gas.

There is one lavatory, with slate tables and moveable zinc basins ; there are wooden gratings on the floor, and the room is well lighted. This lavatory can be reached from any part of the hospital under cover, but the distance from the more remote wards is too great. The structure of the lavatory is likewise much behind that of lavatories in more improved hospitals.

There are three fixed enamelled baths with hot and cold water laid on, connected with the lavatory. There are two coppers, each capable of heating water for seven baths. There is also a shower bath. These bath arrangements are much better than those in any other military hospital we have yet examined, but they are too far from the sick wards.

The laundry is used for washing personal linen, flannels, and table cloths, and for such purposes it appears to be sufficient.

The kitchen has not sufficient means for cooking hospital diets. There are boilers for boiling, stewing, and preparing hot water for tea; there is also an oven and an ordinary kitchen range, but a proper roasting apparatus is required.

Water is derived from a deep well. The water is hard but otherwise good. It is raised by an antiquated pumping apparatus driven by a horse, apt to get out of order, and, when this happens, water has to be brought from Brompton, two miles distant in water carts, in which case 20 carts full are daily required for the consumption of the hospital.

As already stated, Fort Pitt is not sewered, it has only surface drains.

The provision stores are inconveniently situated, and one of them is so dark as to require gaslight in the daytime.

There is a good pack store.

The bedding store is in a damp casemate.

The dispensary is small, and situated close to a cesspool, the contents of which have saturated its walls.

There is no hospital accommodation for soldiers' families.

There is no day-room for convalescents.

The thing most to be commended in Fort Pitt hospital is the plan of block construction, with the windows on both sides, but except in the adoption of this, the only admissible plan of hospital construction, the buildings are not well adapted for hospital purposes.

The wards might be higher with advantage, the blocks are too close together, the painting defective, the beds too crowded; the water-closets are not well situated; there are several large cesspools and offensive privies close to the sick wards.

The additions to the building have been made without any apparent consideration as to what was likely to be their effect on the health of the building. There is a very offensive privy close to the kitchen. The kitchen arrangements are defective, as are also those of the lavatories.

Several of these defects are more or less counterbalanced by the high exposed situation of the hospital, which renders the building more healthy than it would otherwise be.

*The following Measures appear to us to be necessary for improving Fort Pitt Upper Hospital:—*

1. Diminution of overcrowding, by setting apart 1,200 cubic feet to each patient. This can be done in wards 2, 3, 6, 7, by reducing the number of beds from 27 to 15; and in doing this care should be taken that no bed is placed under a window.

In wards 10, 11, 14, 15, the number will have to be reduced from 27 to 14 in each ward.

In ward No. 12, the beds will have to be reduced from 9 to 5.

In ward No. 5 the numbers must be reduced from 16 to 7.

The total available accommodation in this hospital will contain 128 sick and no more, and to do this the orderlies must be removed out of the wards. It is as contrary to sound principles of administration and discipline as it is certainly contrary to the principles of humanity, that orderlies should sleep among the sick. They should never enter the wards for any other purpose than the performance of their duties, and to enable this arrangement to be carried out, separate accommodation must be provided for them, both for sleeping and for taking meals.

2. If the proposed reduction of numbers be carried out, these wards may be ventilated both by day and night by a careful use of the windows; and if the air is ever impure, the blame must be attached to the person charged with the ventilation.

3. The next most important improvement required is sewering the whole of the buildings within Fort Pitt.

For this purpose suitable iron pipes might be carried across the ditches, and made to open into sewers conducted down the slope of the hill to the Medway.

4. As soon as the sewerage is completed, all cesspools and open privies must be abolished, and proper water-closets or water latrines for the officers of the establishment constructed in more suitable situations. Within the hospital precincts water-closets only should be permitted.

5. The present water-closets are situated in the very centre of the buildings, among the sick wards. It would be very desirable to remove them, and to construct new water-closets, with urinals and lavatories, and a bath-room at the far end of each ward. This would enable the existing lavatories, baths, and covered ways to be removed, so as to increase the circulation of air in one of the courts. In fact, all superfluous buildings, or walls interfering with the circulation of air between the blocks, should be removed.

6. Lavatories should be constructed of slabs of slate, with white earthenware basins sunk in them and water laid on, as in the hospital of the Scots Fusilier Guards.

7. The kitchen to be provided with a proper cooking range, and the boilers for making tea to be provided with taps to draw off the water. Tea in future not to be boiled, but infused in large teapots.

8. Improved pumping machinery to be provided for the water supply of the hospital.

9. Provision and bedding stores to be improved.

10. A day-room for convalescents and proper rooms for orderlies to be provided.

11. The woodwork of all the wards to be painted, and the walls and ceilings frequently limewashed.

12. There should be a suitable room set apart in each division for the medical officers.

These improvements, which are necessary for health and efficiency, could only be carried out at considerable cost, and after all the hospital itself, as has been shown, would only accommodate 128 sick. It might be extended to make the accommodation more commensurate with the requirements; but the question arises, whether, considering the local position of Fort Pitt, it is worth while to do so; or whether on the whole, it would not be better to build a more suitable hospital on a more convenient site, and deal with the present hospital merely as a subsidiary establishment. If it is to be continued these improvements ought to be carried into effect without delay.

## 5. CASEMATE HOSPITAL, FORT PITT.

This hospital consists of casemates sunk below the level of the ground on which the upper hospital is built. It is reached by descending flights of stairs. The casements open on the outer side to the external air on the hill sloping towards Chatham; and on the opposite side they open into the deep sunk area already mentioned. Six of them, A, B, C, D, F, G, are used for sick; two others, H and I, formerly used for sick, have been condemned as unfit for the purpose, and are occupied by orderlies and messengers, and one is occupied by the hospital serjeant in charge.

Each of the casemates used for sick is 60 feet long, 15 feet 9 inches wide, and 9 feet high. Each casemate has 5 windows situated at the two opposite ends, so that the distance between the windows is no less than 60 feet.

Each casement has one fireplace; but there are no ventilators in any of them.

They contain 24 beds each, with a space equal to 354 cubic feet per bed.

There are no water-closets attached to this hospital. There are very offensive privies situated on the basement, and only to be reached by passing from the sick wards into the open air, descending a flight of

steps, and traversing a cold, dark, underground gallery. The privies are not drained; they are mere cesspools, the solid contents of which are removed when the vaults are full, which is the case usually once a year. The operation of cleansing usually lasts a week, and the effluvia affects the entire atmosphere of the place. The ashpit is situated in the vicinity of the privies and close to the casemates.

The whole arrangements are as bad as it is possible to conceive.

It is not our intention to recommend any improvements in this hospital. It is perhaps one of the very worst places for the reception of sick in existence, and we would recommend its immediate evacuation. In fact, so bad is it, that the place should only be used for healthy men, under pressure of siege; but at no other time.

Until the middle of October 1847, accommodation was provided in these casemates for sick wives and children of soldiers, and for lying-in women. The accommodation was very defective; but such as it was it has been withdrawn, and the wards closed.

It has been elsewhere stated, that married men occupy barrack-rooms along with unmarried men, and the wives and children of these men have to be attended during sickness in the barrack-rooms, or elsewhere, and dieted at their own expense, except in special cases. There is no separate accommodation for lying-in-women, and there are from 150 to 200 confinements per annum in the garrison. Before the female hospital at Fort Pitt was closed, the admissions of women and children into it were never fewer than 200 per annum, besides about an equal number who were attended in barrack-rooms, and in different parts of Brompton and Chatham.

It appears to us that where a case of such necessity as this exists, there is a clear duty to provide the requisite hospital accommodation. It should certainly not be in Fort Pitt, nor in any other similar casemates; but a special hospital or division ought to be set apart without loss of time for this class of cases.

## 6. LUNATIC HOSPITAL, FORT PITT.

This building is of recent construction, and is rather intended for a house of detention or of observation than for an asylum. Patients are kept generally for a month or two, until their case is decided on, after which they are removed elsewhere if necessary. The building, therefore, should not be judged of as a regular lunatic establishment. The average inmates exceed 20. There are three flats of wards along each side of the building, with a corridor running from end to end, and having the ward doors opening out of it on either side. The corridors communicate by a staircase, which also affords a means of ventilation and light. Each corridor has two blind ends, in which are situated the water-closets, and the only means of ventilating and lighting these ends, is by opening the water closet doors and windows.

The wards and day-room are rather small, and have not that amount of cubic space per man required for the proper management of lunatics, while their small size, moreover, renders frequent entrance through the night necessary for supervision, and irritable patients are apt to be disturbed.

The general ventilation of the building requires improvement. Suggestions for this and for other improvements have been made by the medical officer from time to time, and most of them we understand to have been included in the estimates for the present year.

The fence surrounding the building is only 4½ feet high, and has been frequently cleared by patients at a bound. This defect might be easily remedied. Alterations might also be easily made in the water-closets at the end of the corridor, so as to enable light and air to enter the corridor without interfering with the closet.

## 7. BROMPTON BARRACKS.

These barracks are situated within the lines, and on the top of the hill behind the dockyard. The situation is open and airy. The buildings form three sides of a large square, open to the east. They cover about 11 acres of ground, and their general plan is such as to admit of a free circulation of air among the greater part at least of the ranges of building.

Their internal structure is not so good as the external arrangement of the blocks. The barrack-rooms are all built back to back, four rooms opening out of each passage, and having windows only on one side. They are intended to accommodate from 12 to 15 and 18 men each, and the whole barrack is fixed, by regulation, to hold 1,725 men.

There are two stories and a basement, and the rooms in the basement are partly used for barrack-rooms.

The rooms in the "South Square" are situated in a succession of small quadrangles. The floors are asphalted. A drain runs under this part of the building. The rooms are dark, and would be much improved by a wooden flooring over the asphalt, and by additional light and means of ventilation.

There are no privies or cook-houses attached to these quarters.

The engineer train occupy some new barracks, built in a square. The rooms are over the stables, an arrangement always to be avoided if possible, but otherwise the rooms are airy and light.

The following is the accommodation in Brompton barracks:—

| Barrack Rooms. | Number of Men according to Regulations. | Number of Men at 600 Cubic Feet each. | Number of Men for which there is deficient Accommodation. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| North and South Wings. | | | | | |
| 23 Rooms | 414 | 230 | 184 | 18 | 10 |
| 20 „ | 360 | 200 | 160 | 18 | 10 |
| 16 „ | 192 | 128 | 64 | 12 | 8 |
| Rear Range. | | | | | |
| 20 Rooms | 320 | 200 | 120 | 16 | 10 |
| 1 „ | 13 | 8 | 5 | 13 | 8 |
| 1 „ | 12 | 8 | 4 | 13 | 8 |
| North Square. | | | | | |
| 1 Room | 12 | 11 | 1 | 12 | 11 |
| 12 „ | 156 | 132 | 24 | 13 | 11 |
| 13 „ | 182 | 143 | 39 | 14 | 11 |
| 2 „ | 30 | 30 | None. | 15 | 15 |
| 2 „ | 34 | 34 | None. | 17 | 17 |
| 111 „ | 1,725 | 1,124 | 601 | — | — |

In these 111 rooms there are, therefore, 601 men more than there should be if every man had 600 cubic feet of space.

These barracks have no sufficient means of ventilation. The back to back rooms of the north and south wings communicate through the intervening walls by apertures covered by louvre boarding, but there are no apertures communicating with the external air.

The basement rooms are ventilated by apertures in the ceiling, communicating with the external air, but they are insufficient for the purpose.

The rooms in the North Square are ventilated by openings into the chimney breast, near the ceiling, and they have also perforated zinc ventilators in the walls, but both act imperfectly.

There are no ventilators in the barrack-rooms in the south square. Throughout the building the ventilation is very imperfect. This barrack owes its comparative salubrity to its high, airy position, and the wide surface it covers, but certainly not to its internal sanitary arrangements. If it happened to

have been placed in a densely populated district, it would have probably afforded a much higher rate of sickness and mortality among its inmates than it does.

The medical officer reports the barracks to have been healthy during the past 12 months. They certainly have been so when compared with other barracks at ordinary times, but, nevertheless, there have been 113 admissions into hospital from fever out of a force of 1,121 men.

All the rooms are warmed by open grates, and lighted with gas.

There is no day-room for the men.

There are 14 school rooms, situated in the north wing. They are of the usual dimensions of the barrack-rooms. They are used for the instruction of officers and soldiers of the Royal Engineers and of the Honourable East India Company.

There is an infant and industrial school in the same building, with 103 scholars, and no more than 94 cubic feet of space for each pupil. Additional school-room is required.

There are two libraries in the north wing, one for the serjeants and one for the privates. There is also an excellent museum and model room.

There are 11 ablution-rooms in the barracks.

There are two on the basement story of the north wing, five on the basement story of the south wing, two on the level of the ground in the north squares, and two in the south squares.

In nine of these rooms there is a cast-iron bath, but the use of these baths is restricted because of the occasional scarcity of water. There is, however, a bathing pond to which the men can resort.

There is a most excellent laundry attached to these barracks for the use of the Royal Engineers. It is replete with every convenience, and exhibits, in practical operation, those improvements which ought to be introduced into all barracks.

There is also a wash-house, with troughs and boilers, for the use of soldiers' wives.

Good accommodation has been recently erected for married non-commissioned officers and soldiers of the Royal Engineers. There are rooms for the families of four staff-serjeants, and rooms also for 42 other families; but the rooms are small, they are built back to back, and there are no means of ventilation. The gas burners are also unventilated, and diffuse the impure air from them through the atmosphere of the rooms. Besides these houses there are rooms for 19 families of the Royal Engineers in another building. There are likewise four small rooms in the south square for staff-serjeants.

There are two cook-houses belonging to the north wing of Brompton barracks, containing 16 boilers each, but there are no means of roasting or baking meat.

There are four cook-houses attached to the south wing, with boilers in each. In one of these kitchens only are there two small brick ovens, capable of baking four large dishes of meat in each.

In the north square there is one kitchen with boilers, and one larger oven capable of baking twelve dishes of meat.

The men are stated to appreciate this convenience very much.

The water supply of this barrack, being derived from the dockyard works, is defective for the reasons already stated. It is not enough for sanitary purposes.

There are also underground tanks for storing rain water. The water from one of these tanks was putrid, and stunk abominably. The tank is close to very offensive privies, and appeared to have been polluted by leakage.

The drainage is stated to require great attention in dry weather, apparently from deficiency in the water supply. The drainage on the north side of the barracks leads into a large covered cesspool, from which there is an overflow into the main sewer.

The arrangement is a very bad one, and ought to be done away with. The latrine arrangements are very offensive; and in one instance the matter from a large latrine was seen penetrating the barrack wall below it.

Speaking generally, the drainage is defective, and as, in certain of the buildings, there are no gutters for removing the roof water, it is apt to render the ground floors damp.

There is no proper hospital belonging to Brompton barracks; but two houses in the south wing, calculated to contain 384 men, were temporarily appropriated, at the time of our inspection, for 150 sick, with about 900 cubic feet for each.

Accommodation for sick obtained by appropriating barrack-rooms for such a purpose, it is hardly necessary to say, must be of a very defective nature. Hospitals require special structural arrangements to facilitate the recovery of their inmates, and to appropriate any part of a crowded barrack for such a purpose is simply to increase the crowding in the barrack-rooms, and to endanger the health of the men as well as the safety of the sick.

In our opinion the hospital accommodation necessary for the Royal Engineers and depôt battalions ought to be provided without delay, by extension of the garrison hospital upon an improved plan.

The sanitary defects in Brompton barracks may be summed up as follows:— Overcrowding, defective ventilation, defective sewerage and latrines, defective cooking arrangements.

*For the removal of which we recommend:—*

1. That 600 cubic feet be allotted to every man in barracks.
2. That every barrack-room and school-room be ventilated by a shaft carried from the ceiling to above the roof, and fresh air admitted through perforated zinc cornices near the ceiling.
3. That an additional water supply be obtained.
4. That all the privies be converted into water latrines, with divisions of seats and doors, and flushed out daily.
5. That all cesspools be abolished, and all drains connected directly with the sewers.
6. That the roofs be guttered where required, and rain-water cisterns provided above ground, and the present rain-water tanks abolished.
7. That all the kitchens be provided with the means of roasting and baking meat.
8. That the barrack-rooms in the south square be floored with wood, and additional light admitted into them.

*Brompton Guard Rooms and Cells.*

All the guard-rooms and cells at Brompton barracks are deficient in cubic space.

*The north wing men's guard-room* ought to contain 18 men by regulation, with only 264 cubic feet each. At 600 cubic feet per man it has accommodation for no more than eight men.

*The lock-up* ought, by regulation, to hold 30 men, with 132 cubic feet per man, in a space barely sufficient for seven men.

*The south wing men's guard-room*, like that of the north wing, has 18 men by regulation, where only eight ought to be.

*The lock-up* may be filled with 30 men, giving 150 cubic feet to each, in a room only fit for eight men at the outside.

*The barrier men's guard-room* is set apart for 22 men by regulation, in a space sufficient for eight men.

The prison cells are very small, and afford too little cubic space per man.

The three cells in the north wing have a capacity of 705 cubic feet each.

There are 10 cells in the south wing, which have no more than 312 cubic feet capacity each.

All the guard-rooms and lock-up rooms are, in our opinion, overcrowded, and they all want ventilation.

The number of inmates ought to be reduced, or the guard-rooms ought to be enlarged, and they ought to be ventilated.

The small size of the south wing prison cells shows that better accommodation for prisoners is required.

## 8. HUT BARRACKS, BROMPTON.

There are 24 huts used as barracks for recruits in the vicinity of the Royal Engineer barracks. These are situated on a high airy locality, and are well arranged for external ventilation. Each hut accommodates 22 men, with 360 cubic feet of space per man.

There are two circular ventilators at the sides for admitting air. This arrangement is not a good one.

All huts should be ventilated at the ridge, either by raising the ridge boards a little, or by inserting short ventilating shafts in the ridge.

Hut barracks have the great advantage, in a sanitary point of view, of dividing the men into small numbers, an arrangement which enables their health to be more easily preserved than when they are congregated together by hundreds under one roof. If the huts be constructed of wood, they are very likely to be permeable to air, and ventilation by the ridge will be more easily effected on that account also.

Huts should always be well raised off the ground, so as to have a free circulation of air under the flooring.

There are two lavatories of corrugated iron belonging to these huts, with 18 basins each, with water laid on, and lighted with gas.

The accommodation appears to be sufficient.

There are also two wash-houses with troughs, boilers, and water laid on.

There are two cook-houses of galvanized iron, with boilers and water laid on, and lighted with gas, but there are no means of baking or roasting meat.

There is no covered shed for drilling the recruits in bad weather.

A portion of the drainage of the huts is carried into the main sewer, and the remainder by pipes outside the works.

The latrines of these huts are the most defective part of the arrangements. Boxes are used, which are moved out, and have their contents carted away at night. The operation is very offensive, and is complained of both at the barracks and by the public.

There is no reason why this nuisance should not be removed; the boxes ought to be discontinued, and proper water latrines, with flushing arrangements into pipe drains, substituted.

*We would, therefore, recommend:—*

1. That water latrines and drainage be provided.
2. That the hut ventilation be improved by ridge ventilators.
3. That a roasting oven be provided for the cook-house.
4. It would be a great improvement to erect a covered shed for drilling the recruits—it would be the means of saving sickness on their entrance into the service.

## 9. ST. MARY'S CASEMATES.

These casemates are situated in the curtain of one of the fronts of the lines. They are two stories in height.

The lower story is below the level of the ditch in front, and consequently there is no opening at the end opposite the door, and no means of thorough ventilation.

For many years after the peace of 1815 the building was used as a powder magazine, and since 1844 the whole of it has been by degrees appropriated as barracks for soldiers and invalids returning from foreign service. Four apartments are used as store rooms for the militia.

Forty-seven casemates are used as barrack-rooms; they vary in depth, from back to front, from 59 feet 6 inches to 61 feet 6 inches; their breadth varies from 16 feet 5 inches to 17 feet; and their height to the crown of the arch varies from 7 feet 5 inches to 10 feet 6 inches. They are long, narrow, low arches, placed side by side; the lower tier resembling to some extent, in their sanitary relations, the cellar dwellings of towns.

About half of the number have four small windows at the ends and a fanlight. The other half have two small windows each, at one end only for light and ventilation. The floors are of stone and brick. There is one small fire-place for warming at the end furthest from the door.

Each of these arches accommodates by regulation 24 men. They were formerly used for 30 men each. During the Crimean war this number was reduced to 24, but since the barrack-master's return was sent to us the number has been raised again to 30.

The casemates are at present used partly for healthy men and partly for invalids.

The accommodation is as follows:—

| Rooms. | Regulation Number of Men. | Actual Occupants. | Number of Men at 600 Cubic Feet each. | Excess of Regulation Number over Accommodation. | Excess of actual Number over Accommodation. |
|---|---|---|---|---|---|
| 14 | 336 | 420 | 168 | 168 | 252 |
| 14 | 336 | 420 | 252 | 84 | 168 |
| 8 | 192 | 240 | 96 | 96 | 144 |
| 6 | 144 | 180 | 108 | 36 | 72 |
| 4 | 96 | 120 | 48 | 48 | 72 |
| 1 | 24 | 30 | 18 | 6 | 12 |
| 47 | 1,128 | 1,410 | 690 | 438 | 720 |

It hence appears that, according to regulation, 1,128 men are placed in the cubic space in which no more than 690 men ought to be placed, showing an excess of 438 men: that the actual number of occupants exceeds the regulation number by 282 men, while it exceeds the accommodation by no less than 720 men, and that even if these casemates were otherwise suitable they have space for 690 men and no more. This estimate is based on the assumption that the casemates are occupied only by healthy men: if they were all occupied by invalids at 1,200 cubic feet each, the accommodation would even in a well constructed hospital receive no more than half that number.

At the time of our inspection there were 40 invalids in the depôt, and three of the casemates were ready for the reception of more.

The ventilation is by a moveable fanlight, and by apertures lately introduced opposite the door and covered with perforated zinc. This latter improvement has, it is stated, made a beneficial change in the condition of the atmosphere, but the ventilation is still very imperfect.

Each casemate is lighted by two gas burners which have added much to the comfort of the inmates.

There is no day-room.

One casemate on the upper flat is used as an infant school, and there were 58 children receiving instruction in it. The schoolmistress lives at one end of the casemate. The cubic space would give about 125 or 130 cubic feet for each inmate.

One casemate on the upper flat is fitted up as a library.

One casemate on the lower floor is fitted up as a lavatory. It has 60 basins and is lit with gas.

There are no baths belonging to the establishment.

One of the lower casemates is set apart for washing done by soldiers' wives, but there are no stands for tubs and no washing troughs.

There are boilers for heating water, but the water is not laid on. It has to be carried from outside.

There are no foot-boards to stand on, and no means of carrying off the steam.

The staff-serjeants are provided with quarters. Other serjeants, who are invalids and married, as

well as married soldiers, are accommodated in some of the lower casemates. There are from four to six families in each casemate. Married non-commissioned officers and married soldiers of the depôt battalions live in the barrack-rooms with the men.

There are two kitchens in casemates; they are supplied with boilers, the water for which has to be carried from the outside. There are no means of cooking except by boiling. The kitchens are not ventilated.

There is no covered shed for drill and no cleaning-room.

Water is obtained from the Brompton reservoir, which receives its supply from the dockyard works.

There are also wells, but their yield has decreased in consequence of works at the docks.

The drainage is carried down to the river.

New privies have been recently constructed.

As a place for receiving, on their return home from foreign service, men whose health has been injured, perhaps irreparably in the service of the country, the casemates of St. Mary's establishment are entirely unsuitable. We have no hesitation in stating that they should not be used for such a purpose for a single day longer than may be necessary to provide other accommodation.

The lower casemates are more like cellars than living-rooms. They are damp, dark, and insufficiently ventilated; and, during the warm weather, when invalids arrive in largest numbers, they are greatly overcrowded.

It may, therefore, be inferred that the chief reason why the mortality is not greater, is the short time the men are kept in these places, and to the same cause it is to be attributed that the health of the depôt does not suffer so much as otherwise might be expected.

Even as it is, the number of admissions into hospital, as well as the mortality among invalids, is very great.

Returns sent to us for 22 months preceding Oct. 31, 1857, show that out of an average monthly strength of 749, there were 6,393 admissions into hospital and 142 deaths.

It would thus appear that the admissions per annum are four and a half times the average strength, while the deaths to strength have been 103 per 1,000 per annum. Of these deaths nearly 40 per cent. arose from phthisis. This mortality, it must be remembered, takes place among invalids who have already passed through hospital and been weeded there of the worst cases by death. There is sufficient reason for believing that the sanitary condition of these casemates acts injuriously on the health of the invalids in them.

They are certainly the last places to which consumptive invalids ought to be sent, whether we regard their exposed position, the neighbouring wet marshy ground, or their very defective sanitary condition.

The real difficulty is to know what to do with them. Were there accommodation for the invalids elsewhere, they ought to be at once removed and the casemates vacated; while on the other hand it would require a large outlay to make them habitable as barracks for troops.

There appears to be no course open except to deal with them as we would do with a barrack, and to allot 600 cubic feet for each man in them.

*We advise, therefore:—*

1. That 600 cubic feet of space be allowed to every inmate of the casemates.

2. That all the casemates be provided with additional means of ventilation by air-shafts at the end opposite the door, and that perforated zinc panes be introduced into the fanlights to admit fresh air at all times, and that all the gas-burners be ventilated.

3. That the lower casemates be floored with wood.

4. That the kitchens be fitted up with a suitable roasting and baking apparatus.

5. That the wash-house be fitted up with wooden gratings and stands for tubs, or with washing-troughs, and that a suitable laundry stove be provided.

6. That the privies be converted into water latrines, with suitable flushing apparatus, and flushed out once a day.

There are three guard-rooms and two lock-up rooms connected with the casemates. They are all overcrowded and imperfectly ventilated.

1. *The barrier guard-room* ought to accommodate, according to regulation, 12 men in 1,710 cubic feet of space, giving 142 feet per man. It happens to be occupied by one man. The regulation number of men ought to be reduced from 12 to 3.

2. *St. Mary's guard-room* has regulation accommodation for 14 men, giving only 207 cubic feet for each. It ought to contain no more than six men.

3. *The Magazine guard-room* has 14 men where only six ought to be.

4. In *St. Mary's guard lock-up*, each inmate has only 262 cubic feet when it is occupied by the regulation number of 10 men. At 600 cubic feet per man it would hardly accommodate half the number.

5. The *regimental lock-up* would accommodate 12 men in a space in which 20 men may be placed according to regulation.

All these guard-rooms and lock-up places require ventilation through the ceilings and roofs, besides reduction of numbers so as to give 600 cubic feet per man.

We have made these recommendations in order that the more urgent defects in this establishment may be removed at the least expense; but were it practicable there can be no doubt as to the propriety of removing the troops and invalids from them entirely.

They are best adapted for use in cases of necessity, as, for instance, during a siege, when they may be the means of saving life—at present their effect is probably the reverse.

We have, &c.
SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, July 10, 1858.*

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## TILBURY FORT AND GRAVESEND.

SIR,

WE have the honour to transmit to you the following Interim Report on the barracks and hospitals of Tilbury Fort and Gravesend, both within the Chatham district.

### 1. TILBURY FORT.

This fort is situated on the north side of the Thames, opposite Gravesend, within a few yards of the river. The whole district for a considerable distance round the fort is undrained and marshy, and the inhabitants are liable to attacks of intermittent fever. The ground occupied by the fort is a little above the level of the surrounding country; but it is, nevertheless, about three feet below high-water mark in the river. A broad deep moat passes round three sides of the defences, and the whole subsoil, which consists of alluvial mud, is saturated with water.

The total area within the fort is 3A. 1R. The buildings are of brick, and are supposed to have been erected about 1685.

The soldiers' rooms are in two ranges, situated on the western side of the enclosure. One of these ranges is two stories high, and the other is one story high. At the northern extremity of the one-story range is situated the hospital, and at the southern end are the cook-house, ablution-room, and wash-house. The privies and urinals are in a separate line of out-houses, close to the hospital, and to the end of the two-story range.

The barrack-rooms run through the building from front to back, and have windows at both ends. The upper flat of rooms is reached by an outside stair and corridor, which also serves as a verandah to the rooms behind. There are altogether 14 soldiers' rooms, all very nearly of a size. They are from 33 to 35 feet long from front to back. They are from 14 feet to 14 feet 9 inches wide, and from 8 feet 4 inches to 9 feet 3 inches high. They are not good rooms, on account of their lowness in the ceiling, and the distance between the opposite windows. The beds are ranged along the dead walls, and the rooms are so narrow that when the bedsteads are turned down there is only about seven inches of space from foot to foot of the opposite beds.

In the long one-story building there is a much better room, which was originally intended for a day-room. It is about 84 feet long, nearly 20 feet wide, and 10 feet 3 inches high. It has a range of windows on one side, and a corresponding range of half windows on pivots on the opposite side. One barrack-room was formerly a chapel and school-room; it has no fire-place, and is warmed by a stove. The adjoining vestry is also used as a barrack-room; neither has any means of ventilation. They require perforated panes of glass in the windows.

If the barrack-rooms were occupied according to regulation, there would be a considerable amount of overcrowding in them, as may be seen from the following table :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 2, 3, 4 - | 30 | 18 | 12 |
| „ 5, 6, 7, 8, 9, 10, 11, 12, 13. | 126 | 72 | 54 |
| „ 14 - - | 5 | 3 | 2 |
| „ 15 - - | 40 | 30 | 10 |
| Total - | 201 | 123 | 78 |

By giving somewhat less than 600 cubic feet per man, the accommodation in these rooms is sufficient for 123 men, allocated as follows: Rooms 2, 3, 4, should have six men in each; rooms from 5 to 13 inclusive, should have at the outside eight men in each; and rooms 14 and 15 should have respectively three men and 30 men allotted to them.

The number of men actually in occupation is smaller than the regulation number, and is almost the same as could be accommodated at 600 cubic feet per man; but the men are so distributed that while some rooms are empty, or nearly so, others are crowded. This could be obviated by re-arrangement, and in so malarial a situation the number of men left on guard in the fort should be as few as possible. At the present time the majority of cases admitted to hospital are of intermittent fever, a disease which, if it once attack a man, is extremely apt to recur from very slight causes, and to send the patient frequently to hospital, especially on foreign stations. The more men are kept from unnecessary exposure to marsh miasm at home the better. Occasional changes among the troops in such places as Tilbury Fort are therefore advantageous to health. The usual sanitary precautions as to drainage, cleanliness, ventilation, prevention of overcrowding, &c., are, if possible, more necessary in malarial districts than in healthy ones; and by attending to these matters much of the injurious effects of malarial positions at home may be warded off.

All the barrack-rooms are to a certain extent ventilated, but not sufficiently so, and they are very close at night. The lower rooms have a Sheringham's ventilator at each end, but they have no outlets for foul air.

The upper rooms, and also the long room, No. 15, have openings through the ceilings into the space under the roof, but the arrangement doe not give sufficient outlet, and there are no inlets, for fresh air.

All the rooms should be provided with shafts of the usual form and section to be carried from the ceiling through the roof. Those rooms which have no inlets should be provided with them, and the rooms which have inlets ought to have them enlarged to the required area for the number of inmates.

It is very necessary that barrack-rooms, in such a situation, should, as far as possible, be supplied with fresh warm air, and to ensure this the present grates should be re-modelled to warm part of the admitted current.

All the rooms are lighted by candles; gas cannot be had.

The ablution-room is built against the retaining wall of the terreplein. It has slate ablution benches without ledges; and basins, but water is not laid on, and there is no tank. A large tub in the middle of the floor is the only storeage for water, and it is sometimes used for a bath by the men. There are no pegs for hanging up coats, nor gratings for the men to stand on while washing. Light is admitted to the room by a skylight, but there is no ventilation. A louvre in the roof is required for this latter purpose.

A proper water tank ought to be put up in the ablution-house, and water laid on from it to the tables, and two baths with water laid on ought to be supplied.

There is a small women's washhouse dark, unventilated, and having no means of washing or getting up linen, except a wooden bench and a boiler. The building was formerly an open cleaning shed, and admits of being lighted and ventilated through the roof. It should have a water tank and tubs, and accommodation for drying and ironing linen.

The cook-house has six fifteen-gallon boilers, and a common baker's oven heated with wood. An oven less expensive to use could be put up in the space occupied by the present one, but we do not think it so absolutely necessary as to advise a change to be made. The boilers, however, might be re-set to save fuel.

Water is obtained for the use of the fort by collecting most of the rainfall from the roofs, and by an artesian well 470 feet deep, in which water rises to within 10 feet of the surface, and affords a supply to the extent of 20 gallons per minute. The water contains mineral impregnation, and is not clear. It requires boiling to clear it; it is, hence, only used for ablution purposes. With proper means of raising it this well water might be used for baths, washing, latrines, &c.; and the rain water supply should, at the same time, be extended by collecting the roof water from the new shed recently erected for field batteries.

The privies are of the usual defective construction. They are placed over a sewer carried into the Thames, and when the tides are low enough water is admitted by a sluice from the moat to wash them out. The process is, however, a very imperfect one, and the privies are consequently very offensive.

They should be reconstructed as water latrines, with a supply tank kept full by pumping. They should be properly lighted and ventilated through the roof, and provided with divisions of seats and half-doors.

There is a urinal adjoining the privies, which requires water to be laid on for cleansing it.

We have been informed that during the hottest weather the tides often do not rise sufficiently high to flow into the ditch, which, during long droughts, becomes putrescent, and dangerous to the health of the men. It is stated that this defect might be remedied by admitting water to the inner ditch by

a sluice, which would enable the water to be renewed once a fortnight, and the ditch to be kept full.

The guard-room is a low-ceiled room, 9 feet 4 inches high, without means of ventilation. It requires both an inlet and outlet. For the former purpose we would advise a large silk flap ventilator being placed in the chimney, at a height of eight feet from the ground. An inlet ought, at the same time, to be provided, by remodelling the fire-grate to warm the air, which ought to be introduced by a flue, opening close to the ceiling, above the silk flap ventilator, and at as great a distance from it as possible.

Adjoining the guard-room is a dark lock-up room without any direct communication with the external air. The only means of ventilation is by a grated opening above the door. A shaft should be carried up from the ceiling of the room, as an outlet.

There are two cells at a considerable distance from the guard-room, and having no communication with it. They likewise require ventilation, and should each have a small shaft carried from the ceiling to above the roof.

Tilbury Fort is deficient in day-rooms, married quarters, drill-shed, and workshops. The sanitary improvements required are as follow :—

1. Reduction of the regulation number of men in each room to the extent stated.

2. Ventilation of the barrack-rooms by shafts from the ceiling to above the roof, and by inlets as described. Ventilation of the guard-room. Fire-grates to be re-modelled. Ventilation of the lock-up and cells.

3. Ablution-rooms to be properly supplied with water ; ledges to be put on the tables, and gratings and pegs put up. Ventilation to be provided through the roof. Two baths, with water laid on, to be provided.

4. Women's wash-house to have tubs, gratings, and water laid on, and to be lighted and ventilated through the roof. A drying and laundry stove to be provided.

5. Privies to be reconstructed as proper water latrines, and to have divisions of seats, half-doors, and light and ventilation through the roof. Urinals to be supplied with water.

6. A sluice to be provided for keeping the moat full of water.

*Tilbury Fort Hospital.*

The hospital, as already stated, is situated at the end of the men's quarters, and close to the privies. It is a two-story building, and contains four wards. There is a central passage and staircase, with the wards and offices entering out of it. On the ground-floor there is a ward, and the surgery and kitchen. This ward has a ventilating beam in the roof, bent at right angles, and opening to the outside on the front and end of the building. It has three windows, two to the front and one to the end, and has a door leading into the 40-men barrack-room.

On the upper floor are two small wards, and one large one, the counterpart of the ward below. All these wards are much overcrowded, as will be seen by the following table :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| No. 1 - | 10 | 5 | 5 |
| 2 - | 5 | 2 | 3 |
| 3 - | 5 | 2 | 3 |
| 4 - | 10 | 4 | 6 |
| Total - | 30 | 13 | 17 |

The wards have Sheringham's ventilators into the passage, but the passage itself is not ventilated. The whole building requires additional ventilation. The passage and stair should be ventilated by a shaft through the roof, and by panes of perforated glass.

Each of the larger wards requires a shaft carried from the ceiling to above the roof, and when this is done the ventilating beam will act as an inlet.

Each smaller ward requires a silk flap ventilator in the chimney.

The kitchen, being under a ward, should have a shaft carried from its ceiling to above the roof, and perforated glass panes in the windows.

All the ward fire grates should be remodelled.

The hospital is deficient in bath-room, ablution-room, and serjeants' quarters. It has a water-closet on the landing, recently constructed. Water for it is supplied by manual labour.

There were no sick in the hospital when we inspected it, and the wards contained soldiers' beds arranged for occupation as in a barrack-room.

The medical men do not like to put sick into the building, on account of its malarial position, and the prevalence of intermittent fever. On the other hand it is stated that the medical officers live at Gravesend, whither all cases of illness are taken for treatment.

There can be no doubt that the site of Tilbury Fort is not a healthy one, either for sick or well, though from the usual strength, there are very few cases of disease likely to occur in it which could not be removed at once to Gravesend.

The hospital at Tilbury should, nevertheless, be improved to such an extent at least as to enable it to be occupied either by sick or by healthy men without incurring the expense that would be required to make it a complete hospital.

*The following Improvements will answer either for a Hospital or Barrack :—*

1. Ventilation of the larger wards by a shaft, and of the smaller wards by a silk flap ventilator into the chimney. Remodelling the ward grates to warm part of the admitted air. Ventilation of the staircase by a shaft and perforated glass panes.

2. Reducing the total number of beds, if used for sick, from 30 to 13, in the manner pointed out in the preceding table.

3. Allotting a number of beds in each room, if used as a barrack-room, sufficient to give, as nearly as may be, 600 cubic feet per man, namely in room No. 1, ten beds ; in rooms Nos. 2 and 3, four beds in each ; and in room No. 4, eight beds.

## 2. NEW TAVERN FORT, GRAVESEND.

New Tavern Fort is situated at the east end of Gravesend, about 40 yards from high-water mark in the Thames, and a little above its level. On the west side the fort adjoins the town, and on the east side it overlooks the river and the marshes. The total area within the works is one acre, one rood in extent ; the subsoil is chalk ; and the barrack and hospital are situated on the side of the enclosure nearest the town. The older buildings have massive thick walls and small windows. They were part of a chapelry in the reign of Henry VIII. The chapel itself is divided into floors, and contains barrack-rooms and hospital wards one over the other. The buildings were all revised and repaired in 1841, and have existed in their present form since that date. Besides the old chapel, there is a range of two-storey buildings fronting the public street, in which are the non-commissioned officers' quarters, master gunners' quarters, &c.

There are five soldiers' barrack-rooms with accommodation for 39 men, and two rooms for invalids who are not unfrequently landed in considerable numbers at Gravesend on their way to Chatham.

The following table shows the accommodation :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Soldiers No. 1 - | 10 | 7 | 3 |
| „ „ 3 - | 7 | 5 | 2 |
| „ „ 4 - | 8 | 6 | 2 |
| „ „ 9 - | 9 | 7 | 2 |
| „ „ 10 - | 5 | 2 | 3 |
| Invalids „ 2 - | 11 | 5 | 6 |
| „ „ 7 - | 1 | 1 | — |
| Total - - | 51 | 33 | 18 |

There is accommodation in these rooms for 27 soldiers and 6 invalids, instead of 39 soldiers and 12 invalids which is the present regulation number.

The soldiers' rooms in the old chapel are of a very inferior character ; they are only 7 feet 6, 8 feet 9, and 9 feet 6 inches high. Four of the rooms have two windows each, and the five-men room has only one window. The windows are on one side the room, and the door on the other. The rooms are low and gloomy, and the means of ventilation are very deficient. The upper sashes of some of the windows do not open.

All the rooms have a small Arnott's ventilator in the chimney, but it is quite insufficient for purifying the air in the rooms.

A small bed-room grate is used for warming. Each room has a gas burner in it, but without any means of carrying off the fumes, except the ventilator.

The ablution-room and women's washhouse are in a building at a short distance from the men's rooms ; the former has a slate table without a bead, and there are no gratings nor pegs. There is no bath except a large tub at the end of the room.

The women's washhouse has a boiler, but no fixed tubs, and no means of drying linen.

Behind the chapel there is a small building close to the hospital entrance, in which are situated two cookhouses, one belonging to the barracks and the other to the hospital. They are very confined, and the hospital kitchen is nearly dark. In the barrack cookhouse there are two boilers, but no oven, and there is very little space for one.

Water is derived from a well, and is stated to be abundant and good.

The barracks are surface-drained into the river, but two of the drains require trapping. The privies are of the usual barrack construction, and placed over cesspits, although there are ample means of drainage at hand.

The barrack is deficient in day-room, school-room, and store-room.

The guard-room is an old, dark, and dirty building, and it has no sufficient ventilation. The adjoining lock-up room is also very defective.

All the barrack-room accommodation in this fort is of a very imperfect kind, and by far the best thing to do would be to rebuild the whole of it. The present buildings are not susceptible of much improvement, and we should propose to limit our recommendations to those points absolutely necessary to health.

1. Each man's room should be ventilated by a shaft and inlet ; and the windows should be made to open at top. The guard-room and lock-up should be ventilated by shafts, and the former should have a remodelled grate for warming the admitted air.

2. An oven to be supplied to the kitchen.

3. Ablution-room to have gratings and pegs.

4. A drying stove to be put up in the women's washhouse.

5. Privies to be constructed as water latrines, with divisions of seats, half-doors, light and ventilation ; to be drained into the river, and the cesspits to be abolished. Untrapped drains to be trapped.

*Gravesend Hospital.*

As already stated, the hospital of New Tavern Fort is in the upper floor of the old chapel. It contains three wards, and has regulation space for 27 beds, and is very much overcrowded, as will be seen from the following details :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| No. 1 - - | 6 | 2 | 4 |
| „ 5 - - | 12 | 6 | 6 |
| „ 6 - - | 9 | 3 | 6 |
| Total - - | 27 | 11 | 16 |

The wards, in addition to being overcrowded, are deficient in requisites for the care and treatment of the sick, for which, indeed, they are quite unfit.

Excepting in its malarial position, the hospital at Tilbury fort is better adapted for receiving sick than the one at Gravesend, and it would be well to consider whether Tilbury Fort hospital might not be so used.

At present Gravesend hospital receives sick, not only from other barracks, but also from invalid ships arriving from abroad. If it must be retained for these purposes, a proper hospital should be built, for which there is plenty of Government ground close at hand : and until this be done we would recommend simply that each ward be ventilated by a shaft through the roof, and by an inlet at the eaves.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, April* 8, 1859.

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## MAIDSTONE BARRACKS.

SIR,

WE have the honour to transmit to you the following Interim Report on Maidstone barracks :—

Maidstone barracks are in the Chatham district, but we have considered it better, on account of their not being in the garrison, to report on them separately.

They are cavalry barracks, used as a depôt for all cavalry regiments going to India. They stand on 17A. 3R. 1P. of ground, the subsoil of which is clay and Kentish rag.

They are situated at the outskirts of the town of Maidstone, on the slope of a hill, at the foot of which runs the Medway. The barracks are about 56 feet above the level of the river.

The buildings lie in the form of a rectangle enclosing the parade ground.

They are built of wood, with brick footing ; about four feet high.

The higher side of the rectangle is occupied by the barracks. They consist of three blocks, the centre block is occupied by officers' quarters, and the side blocks are occupied by the men.

This barrack exhibits an illustration of one very good principle of construction. The stables are not under the barrack-rooms, but occupy two sides of the rectangle, an arrangement far more favourable to

health than having the stables under the rooms, as is generally the case in cavalry barracks. On the lower side of the rectangle is situated the hospital and the riding school, some temporary stables, and a room built for a saddlemaker's shop, at present misappropriated to the band.

The barrack-rooms are dark, and the lower rooms are rather low in the ceiling. In the upper rooms the ceiling follows the slope of the roof.

The following is the allotment of accommodation in comparison with what it would be at 600 cubic feet per man :—

| Rooms. | Total Number of Men by present Regulation. | Total Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 20 | 360 | 230 | 130 |

There is room space, therefore, approximately for about 230 men, and no more.

All the rooms require ventilation by shafts, and inlets for the admission of air. Additional light should be admitted to the upper rooms by sky-lights.

The staff-serjeants' quarters are very imperfectly ventilated, and should have Arnott's silk flap ventilators fitted into the chimney, and inlets for air.

The serjeants' mess-room is complained of as being too small.

The orderly room has no covered space for persons to stand in in wet weather, they must stand outside and get wet ; a verandah would remedy this.

These barracks, which appear to have been originally temporary structures, would require reconstruction to make them what barracks ought to be, and this should be kept in view in making any alteration in them.

The school-room is dark, but has ventilation.

There is a small room used as a library to give out books.

The cleaning shed is used as a place from which to issue the provisions.

The urinal is not supplied with water, and is offensive.

The privies drain into cesspits, and are very objectionable, and most offensive. The opening to one of these cesspits is close to a sentry box.

These privies should be improved by converting them into water latrines, and providing them with divisions to the seats, and with half doors. These improvements might be carried out at once, attention being paid to suit the privies when rearranged, to some general plan for rebuilding the barracks.

The ash-pits should be removed, and iron carts substituted, for the daily collection and removal of refuse. The manure heaps should also be placed farther off the barrack square.

The ablution-room is near the back of the stables ; it is dark, damp, and unventilated. The water is obtained from a pump. The benches are of wood, the basins almost worn out, and there are no gratings for the feet. Baths are required in the proportion of one to every 100 men.

The women's wash-house has no drying stove.

The cook-house has no means of baking or roasting ; a space for an oven might be obtained from the armourer's shop, which is close to the kitchen.

The stables are old, they are ventilated in the ridge of the roof.

The water supply of these barracks is entirely from wells. It is in contemplation to supply the town of Maidstone with water from a distance, in which case the barracks could easily be supplied from the mains.

The bases of all sanitary improvements in Maidstone barracks are sewerage and water supply.

The whole barrack requires sewerage, all cess-pits should be abolished, and the whole fluid refuse conveyed away in properly constructed drains. Until the town of Maidstone is supplied with water, it will be requisite to have a suitable pumping apparatus and tank to supply the latrines, urinals, lavatories, &c.

*The following are the Sanitary Improvements immediately required :—*

1. Ventilation of all the barrack-rooms, the guard-room, and lock-up, by shafts from the ceiling, and inlets for air ; and also the non-commissioned officers' rooms in the manner pointed out.

2. Reduction of numbers so as to allow 600 cubic feet per man in every barrack-room.

3. Reconstruction of privies and their conversion into water latrines, with suitable means of drainage and flushing. Supply of water to the urinals for frequent flushing and washing. All cesspools to be abolished, and proper drainage to be substituted throughout the barracks.

4. Providing a sufficient roasting apparatus for the cook-house.

5. A drying-stove to be provided for the wash-house.

6. Lavatories to be improved and lighted by sky-lights, gratings to be provided for the men to stand on, and bathing accommodation in the proportion of one bath to 100 men to be attached to the lavatories.

7. Iron carts to be substituted for ash-pits, and manure heaps to be removed as far as possible from barrack-rooms and hospital.

8. Additional light to be admitted to the school room.

*Maidstone Hospital.*

This building is situated at the lower end of the barrack enclosure.

The wards are at the corners of the building, and, except one of the lower wards, they have windows on two sides.

There are five wards, containing in all 52 beds, with a cubic space ranging from 819 to 1,029 cubic feet per bed.

The following table shows the present accommodation per ward, contrasted with what it would be at 1,200 cubic feet per bed :—

| Wards. | Regulation Accommodation. | Accommodation at 1,200 Cubic Feet per Bed. | Deficiency of Accommodation. |
|---|---|---|---|
| 1 | 6 | 5 | 1 |
| 2 | 8 | 7 | 1 |
| 3 | 6 | 5 | 1 |
| 4 | 16 | 10 | 6 |
| 5 | 16 | 10 | 6 |
| — | 52 | 37 | 15 |

There is space for 37 beds in this hospital, a number which will be found sufficient for all ordinary occasions with such a force as occupies the barracks.

The orderlies sleep in the wards ; a most objectionable custom, which ought to be put a stop to, and proper sleeping accommodation for the orderlies provided.

The wards are lofty and admit of ventilation by the windows, but their ventilation would be improved by shafts and inlets for air. The walls are of wood, and the building is complained of as being cold in winter and hot in summer.

The water-closet is stated to be of bad construction, and to get often out of order.

A range of officers' stables has been constructed with the end close to the hospital.

These stables are not properly ventilated, and the

smell from them can be perceived in the hospital wards.

The kitchen is dark and small; it is stated to be sufficiently supplied with means of cooking. The ablution-room is narrow. Baths are about to be supplied, but a covered communication between the bath-room and the hospital will be required. The privies are over a drain which runs into the river; they should be converted into proper water latrines, an flushed daily. An iron cart or barrow should be substituted for the ash-pit.

The pack store is very damp.

The dirty linen closet adjoins the coal cellar; a better one is much wanted.

The provision store requires a stove.

The water supply is derived from a shallow well, over which part of the officers' stable has been built. The well was open at top, for examination, at the time of our inspection, on account of the water having been rendered impure, apparently from infiltration from the subsoil of the stable.

Accidents such as this can only be avoided by obtaining a proper water supply for the whole barracks.

*The following are the Sanitary Improvements required for this Hospital:—*

1. Ventilation of wards by shafts and inlets for air as pointed out. Ventilation of the central staircase by a louvre in the roof.
2. Reduction of numbers of beds from 52 to 37, so as to give 1,200 cubic feet for each.
3. Present water-closets to be replaced by others of better construction,
4. Baths with a covered communication with the hospital to be supplied.
5. Privy in back yard to be converted into a water latrine, and a small iron cart to be provided in lieu of the ash-pit.
6. Foul linen closet to be provided.
7. Accommodation to be provided to enable the orderlies to sleep out of the wards.

We have the honour to be, &c.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission*, October 4, 1858.

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## SHEERNESS DISTRICT.

THE barracks and hospital at Sheerness, at present occupied by troops, have been erected since the beginning of 1847. The old barracks have been converted into a large school, married quarters, &c.

The new barracks consists of two ranges of rooms, and a range of officers' quarters, forming together one long range in three blocks, running nearly parallel with the sea-shore, and at a short distance from high-water mark.

The line of the works passes immediately behind the barrack ranges, and between the works and the sea there is some undulating sandy ground, used at present partly as a drying ground. The hospital is situated at a short distance from the barracks, and forms a range of buildings isolated and standing by itself, nearly at right angles with the barrack ranges. It is not within the same enclosure as the barracks, although within the lines. The whole establishment, as well as the dockyard and that part of Sheerness called "Blue Town," occupy a point of alluvial land thrown up where the estuary of the Medway joins the sea. A short distance inland, and just outside the works, is another part of Sheerness called "Mile Town," and further inland there is a long stretch of low ground having a radius of about two miles in length, and which is bounded by a chain of low hills to the east and north.

The shores of the estuary of the Medway consist of similar stretches of low alluvial ground more or less covered by the tide at high water. Most, if not all, of the ground in the immediate vicinity of Sheerness itself, has been gained from the sea and estuary by embankments, and it is almost all several feet below the level of ordinary high-water mark. At high tides the sea and river rise to the top of the embankments, and during a recent exceptional high tide, accompanied by a strong north-east wind, the sea overflowed part of the embankment close to the works, and flooded the intervening land.

The country round Sheerness is traversed by broad ditches, partly for defence purposes and partly as a means of freeing the neighbouring land from superfluous water. But there is no drainage, in the proper sense of the term, in any part of the district. Drainage, meaning thereby the removal of all subsoil water to a sufficient depth to make the country healthy, does not exist at present, and cannot exist unless special works similar to those which have been introduced in other marshy districts be resorted to. Another consequence of the want of outlet is, that neither Blue Town nor Mile Town are drained. The whole cesspool drainage has passed into the subsoil ever since they were occupied; all the surface drainage and foul water has taken the same course, unless there has been some hollow into which it could flow. Hence foul stagnant pools of considerable extent exist in several places close to inhabited districts, and the whole atmosphere is tainted with malaria, which extends to some distance from the shore, and produces fever on board men-of-war lying in the Medway.

The usual explanation given of the occurrence is, that intermittent fever is "endemic" in the district. But when we come to ask the further question, why is it endemic? we must reply that the only reason why ague is there at all is simply from *neglect*.

The shores of the Medway and the country around ought, in the 19th century, to be free of ague. If other large districts of England had been neglected in the same way as this corner of the country has been, ague would have constituted a large item in our annual sick and mortality table; but, thanks to enlightened improvement, there is little opportunity of studying ague in its haunts now-a-days unless we go to such places as Sheerness, and other equally unimproved districts along the Thames.

It is time that these marshy, fever-producing districts of England should be dealt with on some general principle of improvement; but in so far as regards Sheerness and two or three other places, the matter is not one of local interest merely, but of national importance.

A large number of men, chiefly of the Royal Artillery, are constantly on duty along the banks of the Thames. The new barracks at Sheerness were intended to hold above 1,000 men. There are a number of persons on duty at the dockyard, besides the crews of men-of-war in the river. All these men in the public service are exposed to the subtle action of marsh malaria, which may not show itself at the time, and perhaps not at all until the men are sent on foreign service within the tropics, when it is found that they give way under the influence of marsh malaria, which ought not to have affected them had the previous constitutional taint not been contracted at home. Even on home service hospital returns have entries of men received into hospital from fevers contracted during service on the banks of the Thames, as in times past was the case with men who had been at Walcheren.

The admissions into Woolwich hospital for ague, occurring among artillerymen engaged on service

along the Thames, have averaged 120 per annum for a number of years past.

During the last three years an eighth part of the force quartered at Sheerness has passed through hospital for intermittent fever every year, notwithstanding frequent changes in the troops.

In a return sent to us by the Director General, it is stated that "On an average of 3¼ years (1857–58–59, and three months of 1860,) the admissions have amounted to 960 per 1,000, being exactly the same as the average of the cavalry, and lower than that of the infantry serving in the United Kingdom.

"The most striking fact with regard to the sickness is the large number of cases of intermittent fever, amounting to 125 per 1,000 of the strength, while the average, as shown in the last volume of the Statistical Reports, was 0·55 in cavalry and 2·74 in infantry."

It hence appears that above an eighth of the total admissions at Sheerness have been caused by ague; that for every admission from ague among the infantry generally, there were 45 at Sheerness, and for every admission among the cavalry there were 225 at Sheerness, on the same strength. On the 10th April, the day we inspected the barracks, one half of all the men in hospital were suffering from ague.

The only remedy for such a state of things is, thorough drainage of the whole district. The air everywhere is tainted by the poison, for we were informed by the medical officer that no difference in liability to the disease was found to exist among men on duty in one part of the garrison more than another. It was stated to us, however, that the inhabitants of Mile Town are more subject to the disease than those of Blue Town. The drainage of both is equally bad, but Mile Town is a little more inland, and there is more stagnant water about it.

The new barracks are constructed in a number of houses two stories high. Each house has a passage and staircase running through and through the building, and along the sea face of each range there is an arched verandah, supported on iron columns, which affords covered communication for all the rooms on each floor. Each house contains eight rooms, four on each floor, so that all the rooms are back to back, half of them with windows towards the sea, and half of them lighted from the south or land side.

These barracks contain 56 men's rooms, all of a size. Each room is 28 feet long, 20 feet 3 inches wide, and 12 feet 6 inches high. They are all 14-men rooms; but 13 of the rooms have 13 men in each with a berth for a non-commissioned officer. Including the non-commissioned officer, each inmate of the rooms has 506 cubic feet of space. Each room has two windows, 7 feet high by 3 feet 6 wide. The rooms on the south side are well lighted, but those on the north side are gloomy, partly on account of the exposure, partly on account of the verandah.

The old barracks are situated at the dockyard end of the new barracks, close to the dockyard gate. They are, like most barracks of the period, imperfectly constructed, low-roofed, and inconvenient. They form one side of the old barrack square. Opposite to them are the guard-room, cells, &c., and on the north side of the square is the canteen, an old, half-ruinous building, hardly fit for occupation.

The rooms in the old barracks are back to back, with small windows on one side only. They are nine feet high, and of varying lengths and breadths. They are from 18 to 19 feet long, and from 15 to 19 feet broad. Altogether there are 45 rooms on the construction as men's rooms, with regulation space for 346 men. These rooms are all bad, and hardly fit for permanent occupation. At present they are chiefly used as married quarters,

The following table shows the present accommodation in both barracks, in contrast with what it would be at 600 cubic feet per man.

| Number of Rooms. | Total present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Number of Men which each Room should contain. |
|---|---|---|---|---|
| New Barrack. | | | | |
| 56 | 784 | 672 | 112 | 12 |
| Old Barrack. | | | | |
| Houses A and C. Nos. 1, 2, 3, and 4, in each (8 rooms) | 56 | 32 | 24 | 4 |
| A., 5 to 14<br>B., 1 to 4<br>C., 5 to 12<br>(22 rooms) | 176 | 110 | 66 | 5 |
| B., 5 to 12<br>(8 rooms) | 72 | 40 | 32 | 5 |
| D., 3 and 4<br>E., 1 to 5<br>(7 rooms) | 42 | 28 | 14 | 4 |
| 45 rooms | 346 | 210 | 136 | — |

It hence appears that there is space in the new barracks for 672 men at 600 cubic feet per man, and for 210 men in the old barracks at the same allowance; making in all 882 men instead of 1,130 men, which is the present number on the construction.

None of the barrack-rooms are ventilated, but those in the new barracks have had remodelled grates put into them. Unfortunately, the method of obtaining air to supply these grates is not a very good one. It is a necessary principle in ventilation to take the fresh air to as great an extent as possible from some elevation above the level of the ground, a matter of especial importance where the soil is malarial in character. In this instance, some of the inlets for fresh air are made above ground, but the general plan has been to take the supply from the level of the ground, close to untrapped gulleys; to carry the supply along the ground, below the flooring of the ground floor of the barracks, and then to carry it up in flues to the spaces behind the fire-grates. This defect can be to a considerable extent remedied by carrying a brick shaft or flue from the inlets at the end of the ranges up to a height of 10 or 12 feet from the ground, so that the air might pass from this height down the shaft before reaching the inlet, instead of sweeping directly over the surface close to gutters and gulley grates as it does at present.

Each room should have the usual ventilating shaft and inlets from the open air. The former carried up in one corner at a distance from the fire-place; the latter close to the ceiling, between the windows. It would be advisable also to ventilate each staircase by a shaft carried above the roof.

The old barracks should be ventilated in a similar manner, at least all such rooms as are intended for future use as barrack-rooms, and all the windows should be made to draw down at top, which is not the case at present.

All the non-commissioned officers' rooms should be ventilated by Arnott's ventilators.

A very good school-room has recently been made in the old barrack by throwing together eight men's rooms. It is well lighted and warmed, but requires more ventilation, which could easily be given round the upper end of the stove pipe. Fresh air should also be brought from without, and allowed to enter the room round the base of the stove.

There is a good library in the left wing of the barracks. It should be ventilated like a barrack-room.

There are four ablution-rooms belonging to the new barracks and one belonging to the old barrack. They are fitted up with slate benches, basins, and gratings, but there are no pegs; and they require more ventilation.

One bath has recently been put up in one of these ablution houses, but it is not sufficiently separated from the place where the men wash. It requires higher partitions.

At least seven baths would be required for the number of men in barracks.

Attached to the new barracks there are four women's wash-houses, fitted up with coppers, fixed tubs, and water laid on. They require means of drying linen.

There is a wash-house belonging to the old barrack of a very inferior character. It requires to be improved in the same way as the wash-houses belonging to the new barracks.

The new barracks have four cook-houses, and the old barracks one. They are fitted up with the usual boilers, and in one of them is a brick oven, which appeared not to be in good repair. As this oven is at a considerable distance from some parts of the barracks, it might be desirable to provide another.

There are no cleaning rooms.

There are no drill sheds specially calculated for their object, but there are two verandahs, already mentioned, running along the back of the barrack ranges. These verandahs are each 200 feet long and 10 feet wide. They are used for drills occasionally, but they are very insufficient for such a purpose. They are not wide enough for drilling, but they are too wide for the light of the rooms, which they obstruct materially in every room along one entire side of both flats of the new barracks. One half of all the rooms are darkened by these verandahs. This evil in the upper rooms might be mitigated by glass skylights over each window in the upper flats; but this could not be done for the lower flats.

These barracks are deficient in workshops. The only shops are one for tailors and one for armourers. The tailors' shop requires ventilation by a shaft and inlet. The armourer's shop requires a louvre in the roof.

Water for the whole establishment is derived from a well within the lines, having a depth of 125 feet, from which water is raised by a steam engine to a tank placed on a water tower, from which pipes are laid to the barracks and hospital. The present yield of water is 7,200 gallons a day, but it is found to be deficient in quantity. It was stated to us that the well would yield a much larger supply were the suction pipe lengthened about thirty feet. This should be done in order to complete the works, on which a considerable sum of money has already been spent without obtaining a sufficient quantity of water for the daily supply of the troops.

All the buildings are drained by glazed earthenware pipes, carried outside the walls. There is a very small fall only for discharging them, and as the supply of water is deficient, they are liable to become obstructed. Several gulley grates are untrapped, and give off foul air close to the barracks.

These defects should be remedied. All gulley grates should be trapped; but in doing this, provision should be made for ventilating each line of sewer by a pipe carried up to a sufficient height to diffuse the foul air at a sufficient distance from inhabited buildings. Each line should also have means of flushing from the higher end. This provision will probably be always required on account of the very small available fall.

There are 12 sets of open privies belonging to the new barracks, undrained, and connected with cesspits behind the buildings, which are emptied periodically. All the objections which we have repeatedly urged against the use of cesspits in confined barrack enclosures, on account of infiltration of the subsoil and pollution of the air, apply with greater force in such cases as the present, where the difficulties of draining the subsoil are so great.

We should certainly advise water latrines to be substituted for these privies as speedily as possible, the cesspits to be filled up, and proper drains to be laid down, through which the latrines could be flushed daily into the sea.

There are two latrines at the old barracks, which are drained by earthenware pipes. All should be drained and all provided with Macfarlane's latrines, or any other form equally economical of water.

The urinals are of stone, and are not of good construction. Improved slate urinals with sufficient water for cleansing should be substituted on the first opportunity for the present ones.

The guard-room of the new barrack is very deficient in ventilation, and all the windows except one are incapable of being drawn down at the top. There are four small and inefficient openings in the ceilings. This guard-room requires roof ventilation on Mackinnel's or Muir's plan, a remodelled fire-grate, and the top sashes of all the windows to be properly hung.

There is a privy, ash-pit, and cesspit at the end of this guard-room, which ought to be removed; and a dust box, a water latrine, and urinal substituted.

The guard-room at the old barrack has a remodelled grate, but no outlet. It also requires a roof ventilator.

The adjoining cells are not sufficiently ventilated, and they were filled with sulphureous vapour at the time we were there, from a defect in the stove pipe. Two of the cells are quite dark. More ventilation through the roof is necessary to keep these cells healthy.

The three guard-rooms of Sheerness barracks are among the exceptional cases in which a sufficient space per man has been given. At the time the return was made to us the men in the main-guard had 576 cubic feet each; those in the barrier-guard 593 cubic feet; and those in the barrack-guard 787 cubic feet per man.

We have already alluded to the canteen. It is in a ruinous condition and much too far away from the new barracks. A new canteen is evidently much required, and the rooms in the present one should be ventilated by Arnot's valves and perforated glass panes.

There are no special married quarters attached to these barracks, but, as already stated, accommodation for married soldiers has been provided in the old barracks. It is not good, but it is perhaps better than could be obtained in the town.

There is a thoroughfare through the barracks to the entrance to the dock-yard, which is complained of as inconvenient and prejudicial. It is proposed to run an iron fence from the dock-yard gate to the barrier-guard to keep out improper characters.

Considered as a whole, these barracks ought not to be unhealthy merely as buildings. It is their local position which causes so much ague among the troops. We were informed that the inhabitants are very desirous to improve the sanitary condition of Blue Town and Mile Town, and that they will proceed with the works as soon as the necessary preliminaries are completed. It is proposed to drain both towns and to conduct the sewage to the shore of the Medway, where it is proposed to place a pumping station to raise the sewage to a sufficient height for discharging it into the estuary.

The point at which it is proposed to place this pumping station is much too close to the hospital, and we have therefore recommended its being placed further away, a change which can be effected with ease.

When these towns are drained, paved, regularly cleansed, properly supplied with water, and the various stagnant pools and ditches, not forming part

of the defences of Sheerness, are drained or filled up, the general atmosphere of the vicinity will no doubt be improved, and the station rendered more healthy than it is at present; but Sheerness will not be so free from intermittent fevers as it ought to be from its open airy position on the sea-shore, until drainage works are carried out, not for the towns only, but for the whole district, similar to those which have in other parts of England not only banished ague, which was formerly as prevalent in those districts as it is in the Isle of Sheppey, but which have, at the same time, added immensely to the value of the land itself.

The present undrained state of the banks of the Medway can only excite surprise in the mind of any one at all conversant with what has been done elsewhere.

Sheerness barracks themselves, as we have shown, require various sanitary improvements, which we beg to sum up as follows:—

1. Reduction of the numbers of men in each barrack-room to give 600 cubic feet per man.

2. Ventilation of all the barrack-rooms by shafts and inlets of the usual construction. In all cases where fresh air for supplying the room fire-grates is taken near the surface of the ground, provision to be made for obtaining the air several feet at least above the surface, and at a distance from gulley grates.

Ventilation of the staircases by shafts through the roof, and perforated glass panes in the windows. Non-commissioned officers' rooms to have Arnott's valves in the chimneys. Ventilation of the guard-rooms by Mackinnel's or Muir's ventilators through the ceiling. Additional ventilation of the cells and school-room; tailors' shop to have shaft and inlet; armourers' shop and one woman's wash-house to have louvres in the roof. Canteen tap and non-commissioned officers' rooms to have Arnott's valves and perforated panes.

3. Ablution-rooms to be provided with pegs. Present bath to be better separated from the ablution-room, and six additional baths to be provided.

4. Women's wash-houses to have drying stoves. Wash-house at the old barracks to have fixed tubs, gratings, and drying stove like the other wash-houses.

5. Water supply to be increased.

6. All privies to be reconstructed as water latrines, supplied with water and drained; to have divisions of seats, half doors, and more light and ventilation; cesspits to be abolished. Better urinals, supplied with water, to be provided.

Means of flushing the main lines of drainage to be provided.

All gulley grates to be properly trapped.

### *Sheerness Hospital.*

This is a new hospital only recently occupied. Its position is open and airy, and it would be healthy were it not for the generally malarious condition of the surrounding atmosphere, and the low level of the site, which is several feet below that of high tides.

The buildings are in a single range, two stories high, with windows along one side. There is a central entrance passing through the buildings, and terminating in a closed corridor, which extends the whole length of the range. At each end of this corridor there is a staircase, giving access to a similar corridor above. On the ground floor are a number of rooms used chiefly as stores, ablution and bath rooms, surgery, medical officers, and orderlies' rooms.

Behind these, and opening out of the corridor, is the kitchen. The upper flat of the hospital is occupied by wards and a day-room.

There are, altogether, 11 wards, with hospital accommodation for 103 sick at from 667 to 723 cubic feet per bed. The following table gives the details as regards each ward in comparison with what the accommodation would be at 1,200 cubic feet per bed:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| Nos. | | | |
| 1 | 9 | 5 | 4 |
| 2 | 9 | 5 | 4 |
| 3 | 9 | 5 | 4 |
| 4 | 11 | 7 | 4 |
| 5 | 11 | 7 | 4 |
| 6 | 9 | 5 | 4 |
| 7 | 9 | 5 | 4 |
| 8 | 9 | 5 | 4 |
| 9 | 9 | 5 | 4 |
| 10 | 9 | 5 | 4 |
| 11 | 9 | 5 | 4 |
| Total - | 103 | 59 | 44 |

In order to give, as nearly as may be, 1,200 cubic feet per bed, it will be necessary to remove four beds from each ward, leaving 59 beds as the available hospital space.

The wards are of three lengths, 25 feet, 25 feet 4 inches, and 25 feet 6 inches; they are all 20 feet in width. Nine of them are 12 feet high, and two are 15 feet high. These last are on the ground floor. Taken as a whole, these wards are of good height in proportion to their other dimensions; but the advantages which ought to be derived from this circumstance are to a great extent neutralized by the fact that the wards have no more than two windows each, that these windows are at one end of the ward, that at the opposite end the ward door opens into the corridor already mentioned. An arrangement by which thorough ventilation is rendered difficult or almost impossible, while the beds are ranged along the dead walls instead of being placed between the windows.

Some provision has been made for ventilation by carrying two four-inch tubes from the centre of the ceiling of each ward to the wall, and thence up in the thickness of the wall to above the roof. Two inlets for fresh air are placed close to the floor, and there is an opening into the corridor over the ward door.

The inlets are placed in the wrong position, and should be removed to the top of the outer wall, close to the ceiling. Cold air should not be allowed to pass over the floor of a sick ward or barrack-room. It cools the floor, and cools the air round the men's feet, at the place where the air ought to be warm. The outlet shafts are much too small, and as the current is bent at two right angles before reaching the outer air, the ventilating effect of the shafts is materially impaired.

We would leave these shafts as they are; but in addition to them, we would propose to carry a square shaft of the ordinary area and construction from one of the corners of each ward most distant from the windows, above the roof; or, if it can be done more economically, one or both of the existing shafts might be enlarged to the required sectional area, and made to open at the angle between the ceiling and wall by an aperture double the sectional area of the shaft. By either plan the up current would be increased to a sufficient degree to keep the ward air pure. At the time of our inspection, partly from overcrowding, partly from these defects in the ventilation, the wards were close and unwholesome.

The ward fire-grates were being remodelled on our plan, to warm part of the admitted air, and hence by the slight change we have advised these hospital wards will be effectually ventilated as far as their structure admits of it.

The corridors are warmed by stoves, but they require ventilation by louvred shafts in the length, carried through the ceiling and roof; or by louvred

skylights in the upper corridor and inlets of the usual construction close to the ceiling.

There is an ablution-room on the ground floor of the main building. It is fitted up like an ordinary barrack ablution-room, with slate tables, and regulation basins. A proper hospital ablution table, with small fixed basins, would be a great improvement, by diminishing the extent of wet evaporating surface exposed within the hospital by the present arrangement.

There are two baths adjoining the ablution-room. They have hot and cold water laid on.

There is a small hospital wash-house, with drying room adjoining, outside the main building.

Behind the hospital, and entering from the back of the corridor, is a large kitchen with a scullery attached. It is sufficiently supplied with means of cooking.

Water is derived partly from the deep well which supplies the barracks, and partly from rain water; the latter is used for the water-closet cisterns.

The buildings are drained by earthenware pipes into the general system of barrack drainage, such as it is, but the fall is very defective, for reasons already stated. There are water-closets within the building on Jennings' self-acting principle, and a double closet in the enclosure behind the hospital.

There is a provision store, pack store, and a medicine store, but there are no other stores. A bedding store is stated to be much required.

A hospital serjeants' quarters, consisting of a sitting-room, bed-room, and kitchen, has been provided on the basement floor, as also a room for orderlies, but orderlies nevertheless sleep in the wards among the sick. The general structure of the building does not admit of orderlies' rooms being so placed as to keep up a proper oversight of the sick by day and night, and hence the orderlies have to sleep in the wards.

One very good feature in the building is a large day-room for convalescents. It is entered from the upper corridor. It is 30 feet 4 inches long, 20 feet 9 inches broad, and 12 feet high, and no doubt is of great importance to the comfort of convalescents.

Sheerness hospital is, we believe, the latest constructed military hospital now occupied in Great Britain. Its general plan and arrangements are not good; the construction is too complicated. There are too many unventilated places and corners within it. The ward construction is faulty, and the arrangement of beds is not in accordance with sound sanitary principles. The plan has, in fact, been sacrificed to the means of access, viz., the corridor, and although the building when seen from without has a certain appearance of spaciousness and neatness, within it has certainly not the attributes of a good hospital.

*It requires Sanitary Improvements in the following Points:—*

1. Four beds should be removed out of each ward.
2. Each ward requires ventilation by a shaft and inlets. The shafts to be provided in one of the ways mentioned; the present inlets near the floor to be built up.
3. The corridor to be ventilated by shafts or by ventilating sky-lights.
4. An ablution table with fixed sunk basins, and hot and cold water laid on to be provided.

JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

June 1860.

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# SOUTH-EASTERN DISTRICT.

SIR,

HAVING completed our inspection and inquiry into the sanitary condition of the barracks and hospitals of the South-eastern district, we have the honour to report the result as follows:—

The barracks which we have inspected in this district are,—

1. The Hut and Royal Artillery Barracks at Shorncliffe.
2. Hythe.
3. Dover, Western Heights.
4. Dover Castle.
5. Walmer.
6. The Royal Naval Hospital, at present used as an infantry barrack, at Deal.
7. Canterbury.

We shall report on each of these stations separately.

## 1. SHORNCLIFFE CAMP.

The camp at Shorncliffe occupies a plateau about 220 feet above the level of the sea, and overlooking it at 1,000 yards distance.

It covers an area of about 120 acres. The soil consists of sandy loam. It has every natural facility for drainage, and is completely isolated from civil population. The site is exposed freely to the sea breeze, and is a very healthy one.

The huts are arranged in double lines, enclosing an extensive parade ground in the centre. They are separated a sufficient distance from each other to allow of a free circulation of air, and the general arrangement of the camp is good, so far as it is calculated to secure the health of the troops.

The surface drainage of the ground about the huts is effected by drains carried along between the lines of huts, with trapped gullies at intervals, by which the surface water is finally conducted to the sea, without passing under any of buildings or huts in camp.

Water used formerly to be obtained from superficial wells, but the whole of the camp is now supplied from the main of the Folkestone Waterworks; as, however, the level is not sufficiently high, the water from the main is thrown up by an 8-horse power steam engine to a further height of 150 feet into a tank capable of holding 45,000 gallons, from whence the water is distributed by pipes to the camp and hospital. The arrangements for water supply appear to be good, but the quantity available is stated to be no more than sufficient for present purposes, so that there would be little or none to spare for water latrines or for flushing sewers.

There are 192 soldiers' huts with regulation accommodation for 25 men in each, or for 4,800 men in all. At the time of our inquiry the average number of men in the infantry huts was 22, and in those of the royal artillery 20.

Each hut is 38 feet 10 inches long, 20 feet broad, and 11 feet high to the ridge. The cubic contents of each hut are 8,360 feet, giving 334 cubic feet for each of the 25 inmates, and 380 cubic feet for the present number, which is 22.

Each hut has 10 windows, two fanlights, and two doors. There is a louvred ventilator at each end, and three ventilators in the ridge of each hut.

These provisions for light and ventilation, together with the pervious nature of the wooden walls of the huts, ought, in our opinion, to be sufficient to keep the air in the huts in a comparatively pure condition, even at night, if the regulation number of inmates be somewhat reduced, and if the ventilators are properly made use of and not interfered with by the men.

We are further of opinion that for the same reasons, and also on account of the excellent principle exemplified in hut barracks, of dividing the men into

a number of detached buildings, with a small number of men in each, it is not necessary, so far as health is concerned, to set apart 600 cubic feet per man, as must be done in permanent barracks.

The principle of subdividing the force among no fewer than 192 separate barracks, so to speak, with air freely playing round them, and ample means of ventilation, makes 400 cubic feet per man of as great a value in preserving health as 600 cubic feet has in a large permanent barrack.

Twenty-five men per hut are, however, too many. The present number, 22 men per hut, is better, but we would prefer that the cubic space at present allotted to the royal artillery, who have 20 men per hut, should be adopted as the limit of accommodation for all the huts in camp.

There are five serjeant-majors' quarters, consisting each of room, closet, and kitchen; five quarter-master-serjeants' quarters with two rooms to each, and 20 staff-serjeants' quarters, two of which are in a room.

The staff-serjeants' quarters are not sufficient, considering the position of these officers.

There are 80 married quarters, but the proportion is below the number allowed for such a force. It would be advisable to increase this accommodation if practicable. At present, no fewer than six separate families are lodged together in a single hut, an arrangement at variance both with health and decency.

The soldiers' huts are warmed by stoves, which are stated to be dangerous, and to require constant repairs. For permanent use, fire-places would be more economical and healthy, as well as safer.

The latrines and urinals are both in the same building. The former consist of iron tanks, in which the soil is deodorized, and removed nightly by the "Cyanic Manure Company." There was some smell in the building when we inspected it, but it was partly owing to the position of the urinals.

In our opinion it would be advantageous to remove these urinals outside the latrines, and to give them the advantage of free circulation of air, which would greatly lessen the effluvia from them.

It would be a better arrangement altogether to substitute water latrines, with flushing arrangements; but it is doubtful whether there would be at present a sufficient supply of water for the purpose, while, if due care be used in deodorizing and removing the soil regularly, we do not think that in so open and airy a locality any injury to health is likely to arise from the present arrangements.

The nuisance, such as it is, may, however, be materially diminished by removing the urinals as already recommended.

There are 20 cook-houses, four in each range.

The kitchen arrangements are undergoing improvements. Two new forms of cooking range, those of Captain Lemprière and Captain Grant, have been introduced, and are on trial. Both ranges contain baking ovens, in addition to the customary boilers. We shall delay expressing any opinion on these cooking ranges, until sufficient time has elapsed to admit of their being fully tried.

There are 10 ablution-rooms, two for each range of huts. Each room has 22 water taps, and is well supplied with basins. There are no gratings for the men to stand on. The benches are of wood, and the method of draining the water from the surface of the bench is not very good.

Gratings should be supplied, and if the camp is to be used for any length of time, it might be advisable to substitute slate benches for wooden ones, or at all events to improve the method of draining off the water when the basins are emptied, by providing a gutter for the purpose.

There are no baths in the camp; the chief difficulty in the way of introducing them is the deficiency of water for such purposes. But this deficiency admits of being supplied, or well water might be raised on purpose from the existing camp wells. About one bath for every 100 men would be required.

There are five wash-houses, one to each range, with six coppers, and water laid on in each; but there are no drying stoves. The barrack-master considers that great advantage and economy might be realized from providing a large establishment in which soldiers' wives could wash the barrack and hospital bedding. But at all events drying stoves and means of ironing linen should be provided for the existing wash-houses.

The means of lighting are at present described as very imperfect. It would be a great improvement to introduce gas, provided the camp is to be permanently occupied.

There is no proper library and reading-room. The present library consists of a single soldier's hut, which has been temporarily set apart for the purpose. It would be a great advantage to provide more suitable and more extensive reading accommodation for so large a number of men as are congregated in this camp. There is a very good site where a library and reading-room might be erected.

There are no workshops, sheds for drill, cleaning rooms, or day-rooms.

The ventilation of the prison cells is not sufficient, and the prison latrine requires to be deodorized and emptied at shorter intervals.

The coal sheds are open above, and it is alleged that the coal deteriorates from exposure to the weather.

We have stated the chief defects which have been brought under our notice with regard to Shorncliffe camp. Many of them refer to matters affecting the comfort and well-being of the soldier, rather than his health. They are all worthy of consideration, with the view to being remedied if the camp is to be continued.

*The immediate recommendations we desire to make are few in number, and are as follow:—*

1. Introduction of means for baking or roasting meat into all the kitchens.
2. Introducing wooden gratings in all the lavatories, and pegs for hanging coats on where required. Also improving the means of removing the water from the surface of the tables.
3. Introduction of baths in the proportion of one bath to 100 men, and increasing the water supply for the purpose.
4. Removal of urinals from within the latrines to the open air.
5. It would be a great advantage to provide suitable day-rooms and drill sheds, and a larger library and reading-room.
6. The married quarters should be extended to make the accommodation commensurate with the regulation number of married people, and huts set apart for married people ought to have suitable divisions between the parts allotted to different families.
7. Every wash-house to be provided with a drying stove and means of ironing linen.
8. Better ventilation of prison cells and better arrangements for deodorizing the prison latrines.
9. Regulation numbers in the infantry huts to be reduced to 22 men per hut at the least.

## 2. ROYAL ARTILLERY BARRACKS, SHORNCLIFFE.

These barracks are built of brick, and were erected in 1801. They have regulation accommodation for 104 men.

There are eight soldiers' rooms, with a cubic capacity of 6,120 feet each, and as each room holds 13 men, the space per man is about 470 cubic feet. Each room has a window back and front, but there are no independent means of ventilation. A ventilating shaft carried up from the ceiling of each room, with means for admitting fresh air near the ceiling, would afford the necessary remedy.

The privies in the barrack are in a very bad condition, and require reconstruction. They consist of a long trough, with a ladder on the top. There is a lean-to roof over this, but no other separation from the open air. The urinal is small and without water; it was offensive. The privies ought either to be converted into water latrines and drained, or else an arrangement of iron boxes with suitable means of deodorizing ought to be adopted as in the hut barracks.

The urinals also require improvement.

One of Lemprière's cooking ranges was being introduced into the kitchen at the time of our inspection. The lavatories are tolerably good, but there are no baths. Two should be provided for the purpose of cleanliness.

The rooms are rather crowded, and ought to have no more than 11 men in each.

*We would recommend, therefore, in regard to this Barrack:—*

1. Ventilation of each room as already pointed out.
2. Reduction of numbers to 11 men in each room.
3. Improvement in the privies and urinals as pointed out.
4. Two baths to be provided.

*Shorncliffe Hospital.*

This hospital is situated on a steep hill slope towards the sea, and considerably below the level of the camp.

It consists of five parallel ranges of wards and offices, of wood and brick, built on terraces cut out of the hill slope, rising rapidly one behind the other.

Each range for sick consists of wards opening out of narrow corridors, which in some instances face towards the sea, and in others towards the hill side. All the ranges are connected by means of a wide wooden staircase roofed with corrugated iron, extending from the upper to the lower range of buildings. Each range contains six wards opening out of the corridor, which is 150 feet long and 5 feet broad. The wards, therefore, have windows to the open air only on one side. Each ward is intended to accommodate 10 sick, so that no more than 60 sick are under one roof, and the cubic space per bed amounts to 700 feet, exclusive of the corridor. From the pervious nature of these hospital huts, their exposed airy situation, the small number of sick treated under one roof, and the temporary character of the hospital, we do not consider it necessary to recommend any further increase of cubic space than can be given by maintaining as equal a distribution of the sick among the huts as may be possible.

Ventilation is effected by windows, and by a ventilator in the roof. The Deputy Inspector-General in charge states the ventilation to be sufficient.

The hospital is well supplied with lavatories and baths, and also with kitchen arrangements.

The chief removable defect in this hospital is the want of a suitable exercising ground for convalescents.

There are the means of supplying this at hand, as there is enough of unoccupied ground.

It simply requires levelling, and suitable paths, seats, and fencing to be provided.

There is at the present time no hospital accommodation for the sick wives and children of soldiers, and there is no accommodation for lying-in women. The sick are attended in camp, and the lying-in women are received into a small house at a distance from the camp, which renders attendance on such cases very inconvenient to the medical officers.

The Deputy Inspector-General proposes to set apart a vacant hut in the uppermost range of the hospital for sick women and children, and he further proposes that an additional hut be erected on the hill slope above the sick-hut for lying-in women.

The proposed arrangement appears to us to be good, and we would recommend its being adopted.

*We would recommend for this Hospital:—*

1. That a suitable exercising ground, with covered seats for convalescents, be provided.
2. That hospital accommodation be provided for sick women and children, and for lying-in women, on the site pointed out by the Deputy Inspector-General.

## 3. HYTHE BARRACKS.

These barracks were originally erected for the staff corps. They are now used as a school for musketry. The barrack-rooms are in two blocks, and are situated on flat ground at the foot of a sloping field, from the drainage of which much of the water for the barrack is derived.

The rooms are tolerably lofty, with windows at each end, and a fire-place in the centre, on the side next the door.

The joists of the floor are bedded in the ground.

All the rooms have a hollow beam traversing the ceiling from back to front, and communicating with the external air at each end. The beam is perforated with openings near its middle, to admit of some degree of ventilation taking place; but the ventilation is insufficient in amount for the size of the rooms, and the number of men, and might be readily improved by carrying up a shaft from the ceiling of each room to the roof of the building, by making inlets for air, and by altering the windows to make them open at top, which is not the case at present.

The following is the accommodation in this barrack in comparison with what it would be at 600 cubic feet of space per man, which we are required to allot by our instructions:—

| Rooms. | Regulation Number of Men per Room. | Total Regulation Number of Men. | Men per Room at 600 Cubic Feet each. | Total Number at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|---|
| 6 | 20 | 120 | 15 | 90 | 30 |
| — | 20 | 100 | 13 | 65 | 35 |
| 1 | 20 | 20 | 13 | 13 | 7 |
| Kitchens— | | | | | |
| Nos. 1 to 6 | 4 | 24 | 4 | 24 | — |
| No. 7. | 4 | 4 | 3 | 3 | 1 |
| Total - - | — | 268 | — | 195 | 73 |

The rooms do not admit of being divided into equal spaces of 600 cubic feet each; and considering that there are no buildings near the barracks, we have calculated the amount of cubic space in the above table somewhat below 600 feet, so as to accommodate as many as possible.

The regulation number exceeds the accommodation by above 73 men.

There are 27 rooms, arranged like cottages, which have been long used as married quarters. The rooms are small and not well ventilated, and there is no thorough draught across them from back to front; but notwithstanding these defects they exhibit a favourable specimen of the kind of accommodation provided at the period of their erection. The ventilation of the rooms might be easily improved by introducing an Arnott's silk flap ventilator into each chimney, near the ceiling.

There is a long narrow lean-to building, used as a lavatory for the barracks, with a bench, basins, and water laid on, but there are no baths, although accommodation might be found for two at the end of the ablution-room. There are no pegs for hanging coats.

The cook-house is dark and small. It has eight boilers, but no means of roasting or baking meat.

The meat-house requires ventilation.

The latrines are at some distance from the barracks, and there is no shelter for men going to them in wet

weather. They are flushed into the neighbouring canal by a stream of water passing through them. There are no divisions or half doors. The former might be easily supplied, but there is not space enough for the latter. There is no separate latrine for non-commissioned officers.

The urinals are close to the barracks, but they are not supplied with water.

The barracks are drained by a barrel drain, and the inlets are generally trapped. The surface drainage of the back yard is, however, very imperfect on account of defective paving. This admits of easy remedy.

There are no day-rooms, cleaning-rooms, covered shed for drill, mess-room for non-commissioned officers, nor accommodation for pursuing trades on the construction of the building.

There is no proper laundry belonging to this barrack. There is only a women's wash-house, situated at the soldiers' barracks, and at a distance from the married quarters. There is a space of ground near the married quarters, with an adjacent water supply, which would afford the means of erecting a convenient and suitable laundry.

The water supply is derived from a spring in the field behind the barracks. There are also rain-water tanks. For washing purposes the water is raised from the canal, which receives the drainage of the barracks and also that of the neighbouring town of Hythe. This canal is stagnant, and during every summer it gives off offensive effluvia. There can be no doubt that some steps should be taken to remove the nuisance, either by cleansing, or if possible by renewing the water in it from time to time, and diverting the drainage out of it.

The guard-room of these barracks is in the centre building. It is low-ceiled, dark, and imperfectly ventilated. The cells adjoining are cold and damp.

*The following are the Requirements for Health:—*

1. Ventilation of barrack-rooms by hanging all the windows so as to open at top, and by shafts carried up from the ceiling of each room to the roof of the building, with proper inlets for air. Ventilation of the guard-room in a similar manner. Ventilation of the meat-house.

2. Reduction of numbers of men in the rooms to the extent stated above.

3. Repair of pavement and guttering in back yards, and improvement in the surface drainage.

4. Two baths to be provided with water laid on, and pegs in the lavatory for hanging coats.

5. Cook-house to be provided with means of roasting or baking meat.

6. Privy to have the seats properly divided, and urinals to be supplied with water for flushing.

7. Improved laundry to be provided.

8. Each room in the married quarters to be ventilated by an Arnott's silk flap ventilator into the chimney.

These requirements are of the most immediate importance to health, but the other defects mentioned above, namely, the state of the canal; the want of drill sheds, workshops, non-commissioned officers' mess-room, day-room, cleaning-room, and the condition of the prison cells should be remedied as soon as possible.

### *Hospital, Hythe.*

This building is situated close to the barracks. It contains four wards, with regulation accommodation for 36 beds.

There are two wards, numbers 1 and 4, each having 12 beds; and two wards, 2 and 3, with six beds in each. In the two larger wards the cubic space per bed is 634 feet, while in the two smaller wards it is 585 cubic feet per bed.

The average cubic space per bed is therefore less than one-half of what we are required to set apart by our instructions.

The wards are ventilated by hollow beams, in the same manner as the barrack-rooms, and recently the windows have been hung to draw down at top.

There are two water-closets within the building, to which the water is supplied by taps. The arrangement is not a good one, and soil-pans of improved construction would be better.

There is a privy in the hospital yard, periodically flushed, but it is offensive, and requires improvement. The urinal is under the same roof as this privy, and is not supplied with water.

There is no ablution or bath room belonging to the hospital.

The kitchen is not well supplied with the means of cooking. The grate is insufficient.

The only entrance to the building is by a narrow doorway through the surgery at the end of the building. The proper door of the building has been closed up, and might be reopened with advantage, provided an outside porch were added to it.

*The following are the Requirements for Health:—*

1. Additional ventilation of the wards by shafts from the ceilings to the roof, and inlets for air. Front door to be reopened.

2. Reduction of number of beds to half their present number. This could easily be done. The average force at the barracks is 233, which ought never to yield sick enough to occupy 36 beds at one time.

A safe rule would be to distribute the current sick as equally over the space as possible, and if this were done, and the extra beds removed, it is very probable that each patient would have about 1,200 cubic feet of space.

3. Kitchen range to be improved or replaced by a better one.

4. Water-closets to be improved. Urinal and privy in the yard to have a better water supply and more frequent flushing.

5. Lavatory and bath-room with fixed bath, and hot and cold water to be provided.

## 4. DOVER.—WESTERN HEIGHTS.

The barracks and casemates on the western heights at Dover are all situated in open, airy, and lofty positions, removed from the civil population of Dover, and having the sea breeze freely sweeping round and over them. The sub-soil is chalk and self-draining, and even in the casemates hollowed out of the rock, there was not that amount of dampness when we inspected them which their position would have led us to anticipate.

The access to the barracks from the eastern side of the town is by means of a shaft, at the foot of which is situated a guard-house.

This guard-room has no ventilation, and is too small for discipline, as it is required to hold the prisoners taken by the picket in the town, and also the picket itself, which is a strong one. It is stated that a sufficient addition to it would cost 600*l.*

The privy belonging to this guard-house is very defective and offensive; it requires to be reconstructed with divisions and doors; it is occasionally flushed, but water does not stand in it. As there is a sufficient supply of water, it should be converted into a proper water latrine, and flushed out either once or twice a day, as might be required. The space occupied by the privy is very narrow, and in order to keep the back clean, an arrangement, similar to that in the privy of the hospital of the castle barracks, should be adopted, viz., a perforated pipe running along the back of the seats with water turned on in the manner done with the water supply of urinals.

The drainage from the latrines of the Western Heights barracks is brought down into the town sewers by a vertical pipe close to the shaft and stair,

and when the privies are flushed, the mass of water falling suddenly down this pipe from so considerable an elevation, causes the sewer gas to force the traps, and escape into the houses in the town, and into the shaft of communication between the town and the Western Heights. The regular flushing of the barrack privies above is hence impracticable on account of the nuisance occasioned by it.

To obviate this it would be necessary to form a large tank at the bottom of the shaft, capable of holding the greatest quantity of sewage that would be sent down at a flushing, with a trapped pipe leading into the town sewer; from the top of the tank an open pipe of sufficient dimensions would have to be led half-way up the cliff outside, to allow the displaced gas to escape. The flushing of the barrack privies would fill the tank, and the foul air in it would escape up the air pipe provided for the purpose. The tank would then empty its contents slowly into the town sewers, and the nuisance would be avoided.

Troops are accommodated on the Western Heights in the following barracks:—

1. Western Heights barracks.
2. Drop redoubt casemates.
3. Citadel, comprehending,—
   - Long casemates.
   - Short casemates.
   - South lines.
   - West face casemates.

### Western Heights Barracks.

These barracks were erected about the beginning of the present century. They consist of two parallel blocks, of which the front range is three stories high, and the rear range four stories. The lower story in the rear range is occupied by ablution-rooms, stores, cooking houses, &c.

The front range has detached cook-houses, ablution-rooms, and urinals in the rear, separated from the buildings by a passage only a few feet in width.

The following table represents the accommodation in the Western Heights barracks according to present regulations, and also what it would be if 600 cubic feet of space were allotted to each man:—

| Rooms. | Regulation Number of Men per Room. | Total Regulation Number. | Number of Men per Room at 600 Cubic Feet each. | Total Number at 600 Cubic Feet per Man. | Deficiency of Accommodation. |
|---|---|---|---|---|---|
| 51 | 21 | 1,071 | 16 | 816 | 255 |

To give 600 cubic feet per man, it would therefore be necessary to remove five men out of each barrack-room, and to provide additional accommodation for 255 men.

The barrack-rooms are all alike; they run through the building from front to back. They are tolerably lofty, and have windows at each end. The main defect in their structure is that the wooden staircases, giving access to the different flats, are all taken off from one end of the barrack-rooms, hence the rooms are not so light as they might be, because the windows at one end are blocked up by the staircase, as well as by a partition enclosing a small berth for a non-commissioned officer. If the non-commissioned officer is married, his wife uses the barrack fire for cooking.

The barrack-rooms have no ventilation. To remedy this defect, shafts should be led up from one corner of the ceiling through the roof, and as the ceilings are covered with plates of zinc, the best plan for supplying fresh air would probably be to admit air between the zinc ceiling and the floor above, at the ends of the room, and to perforate the zinc with numerous small holes, about one-eighth or one-sixth inch diameter; these holes should be most numerous towards the centre of the room. By this plan, the air might be preserved sufficiently pure without draughts.

There is no place for keeping cleaning materials or utensils, and hence the mops and urine tubs are collected together during the day at one end of each room, and give rise to unpleasant smell in the rooms. This is a very common evil in barracks, only to be remedied by the introduction of improved urinals.

Gas is provided for these barracks in this year's estimates.

The ablution-rooms are good, and have pegs and wooden gratings for the men to stand on, but there are no baths. These are required in the proportion of one bath for every 100 men. At the back of the rear range there is an ablution-room, which might be converted into a bath room. If these rooms will not afford the required space, a bath room should be built.

The kitchen in the basement of the rear block requires one or two shafts to be carried up through the roof to ventilate it, and perforated panes of glass to afford inlets for air.

The kitchen is supplied with boilers, but there is no oven or means of roasting meat.

The urinals are at the back of the barrack, and are of slate. The space which they occupy is rather confined, and water should be laid on. These urinals are ventilated by louvred windows on the side facing the barracks. They require openings in the wall close to the roof on the other side, in order to afford through ventilation, and to carry off the smell from the barrack windows.

In the area at the back of the barracks, there are drains which are used for emptying slops, &c., which require to be trapped, as also all the rain-water drains in this neighbourhood.

The privies are at some distance from the barrack-rooms. They are in a court together with the urinals. The privies are in a spacious covered building, the seats being placed back to back, and slate divisions being carried to a height of four feet from the ground.

Water for flushing these privies is obtained by collecting the drainage of lavatories and urinals in a tank. Although this tank is at a distance from buildings, the putrescent fluid it contains adds unnecessarily to the nuisance of the latrines. A proper water supply ought to be laid on to the flushing tank as is the case in other barracks, and the present practice discontinued.

In consequence of the difficulty of drainage alluded to, these latrines are rarely flushed at present. When this defect has been remedied, arrangements should be made to keep water continually standing in the receptacle, and to flush them once or twice a day.

The water supply is derived from a deep well, from which it is pumped up by a steam-engine in the citadel, and distributed to the whole of the buildings on the heights.

The whole of the barracks are drained. The storm waters are conducted directly into the harbour, and the other drainage into the town sewers, as already mentioned.

There is a good fives-court close to the privies.

The ablution-room of the front range of barracks is at the back of the barracks. It is narrow, but otherwise complete, except that baths are required.

The cook-house belonging to the front range is placed at some little distance from the barrack. It is confined and small, and has only boilers, no means being provided for baking or roasting meat.

The refuse of the barracks is collected and kept in uncovered ash-pits until it is removed. These ash-pits should be abolished, and the refuse collected and removed daily in an iron cart.

The women's wash-house is small, and requires a drying stove. It is in contemplation, we believe, to construct a proper laundry in connexion with the proposed married quarters; but until this laundry is completed, it will be necessary to provide a drying stove for each wash-house on the Western Heights.

The canteen is close and small for the number of

men it has to accommodate, and would be improved by ventilating glass panes in the windows.

Above the canteen is a room intended as a reading and coffee room for the men, which requires similar ventilation.

The serjeants' mess-room is good, but also requires ventilation by means of a shaft and inlets for air.

The library requires ventilation in a similar manner.

The staff-serjeants' quarters are very good.

There are no cleaning-rooms, or covered sheds for drill, and no workshop, except one tailor's shop.

The regimental guard-room requires ventilation by a shaft and inlet for air.

The existing cells should be moved to the tailor's shop, in order to be close to the guard-room, and the tailor's shop placed where the cells are. A water latrine and urinal is required for this guard-room.

*The following are the Sanitary Requirements for the Western Heights Barracks :—*

1. Ventilating all the barrack-rooms, guard-rooms, canteen, serjeants' mess-room, library, urinals, &c., in the manner pointed out.
2. Reduction of numbers of men in barrack-rooms.
3. Construction of water latrines, improvements in connecting the Western Heights drainage with the town drainage, and trapping of all untrapped gulley grates, as recommended. Urinals behind the back range to be ventilated, and to be supplied with water as described.
4. Kitchens to be supplied with means of roasting and baking meat.
5. Laundry and drying stove to be provided for wash-house.
6. Barrack refuse to be collected and removed in iron carts..
7. Bathing accommodation to be provided as described, in the proportion of one bath to 100 men.
8. Guard-room at the foot of the shaft to be enlarged and ventilated, and the adjoining privy converted into a water latrine, as recommended.

Lastly, a drill shed, a day-room and cleaning-rooms, as well as workshops, ought to be provided with as little delay as possible.

### Drop Redoubt.

This redoubt is occupied by a company of artillery; it contains three casemated rooms, each accommodating by regulation 25 men, and one casemate for married people. It is provided with a slated roof and a passage all round outside, so that the rooms are remarkably dry.

They are built of the parabolic form, are lofty, and have windows at both ends, but they have no means of ventilation except by the windows. Ventilation should be provided by a large Arnott's silk flap ventilator into each chimney, and by inlets for air through perforated panes, or otherwise. Reconstructing the grates to warm the admitted air during winter would be a great advantage. The outside doors are protected from the weather by a shed.

The cubic space per man varies from 443 in the men's, to 675 cubic feet in the married quarter, which latter, however, is the amount provided for a family. Considering the small number of men in these casemates, and their airy exposed situation, as also their structure, we do not think it necessary to recommend reduction of numbers, until at least the proposed ventilation has been tried.

The ablution-room is very small, and not sufficiently lighted ; there is a grating for the men to stand on, but no pegs for hanging coats on. The water is obtained from pump.

The urinals have no constant supply of water. The privies are provided with means of flushing, but they should be converted into water latrines ; they also require divisions and half-doors, and ventilation should be provided through the roof.

The guard-room and lock-up place belonging to the drop redoubt are small, dark, and imperfectly ventilated. We understand it is proposed to reconstruct them on a better plan.

*We would therefore recommend for the Improvement of these Barracks :—*

1. Ventilation of the rooms in the manner described.
2. Converting the flushed privies into water latrines, ventilating them through the roof, and supplying the urinals with water for occasional flushing.
3. Pegs to be placed in the lavatory.

The proposed reconstruction of the guard-room and lock-up ought to be proceeded with.

*Chapel School on the Western Heights.*

This is an excellent building for its purpose, but it requires ventilation, which might be easily afforded, to some extent, by making the circular windows at the ends of the aisles to turn on pivots, and by admitting air along the outside of the pipes which are employed in cold weather to warm the chapel. If this ventilation were found to be insufficient for the number of scholars, it would be necessary to make dovecot openings in the roof, which would effect the object without interfering with the architecture of the building.

### Citadel.

The citadel occupies an area of about nine acres on the summit of the heights, exposed at all points to the winds. The works are still in progress ; but up to the present time barrack accommodation has been provided for 654 men in four separate sets of casemates, designated as "short casemates," "long casemates," "west-face casemates," "south-lines," most of which are of a very superior and more healthy construction, as compared with casemates of a more ancient date.

The guard-house at the citadel gate is a temporary building of wood, without ventilation, a defect that could very easily be supplied by a shaft from the ceiling, with an inlet for air.

The casemates are of the parabolic form, with an average height of 13 feet, although the summit of the arch is much loftier. They are 18 feet wide, and vary in length from 51 feet to 86 feet ; they have from five to eight windows each at the ends, the loftiest of which is about seven feet high, and a small circular window or opening, high up at each end. There are three fireplaces in each room, which might be remodelled, so as to warm the inflowing air in winter, and rendered available for increasing the ventilation by having a large Arnott's silk-flap valve inserted into the chimney, as high up as possible. The circular windows are intended for ventilation, but are apt to be stopped up by the men. In order to effect their object of keeping the air pure, without drafts, they should be filled with panes of perforated glass.

The following is the barrack accommodation in the casemates :—

| —— | Number of Rooms. | Cubic Feet of Space per Man. | Number of Men in each Room. | Total. |
|---|---|---|---|---|
| Short Casemates | 1 | 574 | 21 | 21 |
| ,, | 1 | 603 | 20 | 20 |
| Long Casemates | 2 | 527 | 34 | 68 |
| ,, | 1 | 563 | 36 | 36 |
| ,, | 1 | 548 | 37 | 37 |
| ,, | 1 | 540 | 22 | 22 |
| ,, | 1 | 516 | 23 | 23 |
| West Face - | 5 | 566 | 32 | 160 |
| ,, | 1 | 585 | 31 | 31 |
| ,, | 1 | 571 | 32 | 32 |
| ,, | 1 | 589 | 31 | 31 |
| ,, | 1 | 573 | 34 | 34 |
| ,, | 3 | 1,993 | 8 | 24 |
| South Lines - | 2 | 460 | 22 | 44 |
| ,, | 2 | 490 | 22 | 44 |
| ,, | 1 | 608 | 27 | 27 |
| Total - - | 25 | — | — | 654 |

These casemates, as will be seen by the cubic space per man, are very little overcrowded.

The average cubic space is so near that which we are required to fix by our instructions, that it might be readily obtained by a little re-arrangement of the beds. The smallest amount is that given by four casemates in the south lines, which have each four or five men too many in them.

We would recommend, therefore, that the space be allotted so as to give as nearly as may be 600 cubic feet per bed. The main sanitary precaution required is to see that the means of ventilation which have been provided in the construction, and the additional means recommended, are properly made use of, as advised above.

Three of the casemates in the west face are appropriated for married soldiers, and are divided into separate rooms by partitions seven feet high, with a passage down the centre, a space to be used in common being left near each fireplace.

The women's wash-house requires a drying stove.

A cook-house, adjacent to the casemates, converted into married quarters, is used occasionally for a wash-house; it also has no drying stove.

The cook-houses have no ovens for baking or roasting meat.

The ablution-rooms require ventilation through the roof, either by means of a dovecot or shafts; the coat pegs are placed over the basins instead of on the back wall; the ablution-rooms are provided with gratings and forms. There are no baths; these should be supplied in the proportion of one bath for every 100 men.

The urinals are not supplied constantly with water.

The latrines have divisions between the seats, but are not furnished with half-doors; they are capable of being flushed, but the water does not stand habitually in them; they should be altered to admit of this being done.

The whole water supply of the Western Heights, as already stated, is derived from a well in the citadel, from which water is pumped up by a steam-engine.

This steam-engine is stated not to be of sufficient power to keep a constant supply, in consequence of the large amount of water wasted by the men.

It is probable that if each ablution-room and privy were furnished with a separate cistern, the waste would not be so great.

There are no cleaning-rooms, bath-rooms, nor shops for pursuing trades; there are no day-rooms, nor covered sheds for drill.

There is no laundry, although it is intended to construct one in connexion with the proposed married quarters. Up to the present time no officers' quarters, nor accommodation for head-quarters of a regiment, have been provided in the citadel.

We have stated generally certain defects appertaining to all the barracks in the citadel, and now subjoin a few remarks on defects existing in individual barracks, and specially connected with their peculiarities of construction.

*The Long Casemates.*—One set of these casemates has large windows at both ends; the other set has windows at one end only, opening into a deep square well, and air flues at the other. There is one fireplace in each. The whole of the long casemates should be provided with perforated glass in the upper windows, and the casemates which have not windows at both ends should only be used for quarters when absolutely necessary.

The ablution-room is very dark; probably a reflector would improve this. There are no baths.

The cook-house is also very dark. It is provided with boilers, but with no means of roasting or baking. It requires a reflector, and a roasting oven.

The urinal is close to the barrack-rooms, and should have a constant supply of water to keep it sweet.

The ash-pit is constructed in the wall of the court, and is covered. It would, however, be very desirable that iron boxes should be substituted, and that when full, they should be removed by the contractor. There is a crane which would be capable of lifting and lowering the boxes into the yard.

*The Short Casemates* are stated to be seldom occupied by troops.

The cook-house has no oven or means of roasting.

The ablution-room is very small, and has no bath.

The privies can be flushed, but are not proper water latrines; that is, the water does not remain in the troughs, as it ought to do, between the times of flushing.

*The South Lines* are not occupied at present. The casemates are good; each contains a room partitioned off for the non-commissioned officer.

There are, however, no means of ventilation; probably the best way of supplying this would be by perforated glass panes in the upper windows, or by circular openings filled with perforated glass close to the top of the arch.

Each room contains two fireplaces. A large Arnott's ventilator, opening as high up as possible into the chimneys, would assist the ventilation, not only in these but in all the other casemates.

The ablution-room is good, but there is no bath.

The cook-house has no oven or means of roasting meat.

The urinals are of slate. They require water to be laid on.

The privies, as in the other lines, are provided with means of flushing, but are not proper water latrines.

As already stated, the citadel casemates are in many respects superior in their structure and accommodation to any others we have hitherto examined, and show a great advance in providing suitably for the health and comfort of the soldier, notwithstanding the difficulties arising from the necessary peculiarities of casemated barracks.

The chief defect at present in the Western Heights barracks, as a whole, appears to be in the water supply. The quantity raised by the engine would appear to be sufficient for every purpose; but it is doubtful whether, considering the amount of waste by the men, it would be enough for water latrines, urinals, and baths. It appears to us to be necessary that improvements in these conveniences should be introduced throughout the barracks, and the question would be,—whether enough of water might not be saved for every purpose out of the present supply? We would advise that steps be taken to ascertain this at once. We have reason to believe that there is enough, if it be properly economized. If there be not, additional engine power would have to be provided.

*We would recommend the following Sanitary Improvements to be carried out at the Casemates:—*

1. Conversion of all privies into water latrines, and introducing divisions of seats and half-doors where it has not been done.
2. Supplying all urinals with water.
3. Substituting for ash-pits, iron carts for collecting and removing all barrack refuse daily.
4. Providing bath-rooms and baths in the proportion of one bath to 100 men.
5. Providing means for baking or roasting meat in every cook-house.
6. Filling up the circular windows at the ends of the casemates with glass as fully perforated as possible; inserting similar perforated glass panes at the top of all the highest windows; remodelling the grates to warm the inflowing air; and introducing an Arnott's large silk valve ventilator into each chimney. Ventilating at the roof all guard-rooms, lavatories, privies, and urinals, which require it.
7. Arranging the accommodation so that each man may have as nearly as may be 600 feet of cubic space to sleep in.
8. Introducing reflectors to throw light into the ablution-room and cook-house of the long casemates.
9. Providing drying stoves for the wash-houses.

Lastly, in carrying out the works, staff and officers' quarters, proper guard-rooms, day-rooms, drill sheds, reading-rooms, and married quarters, for the last of which an excellent site is pointed out, ought to be provided.

*Western Heights Hospital.*

This building stands on the side of the heights facing the sea, and has an appearance from a distance of being a much better hospital than it is in reality. It is divided into two parts, called the *East* and *West* hospitals, the former of which is occupied by sick of the artillery, and the latter by sick of the line.

The building is defective in many important particulars. It is not surrounded by any enclosure, and there is no exercising ground for convalescents, except a piece of road, a thoroughfare, in front of the hospital. In consequence of this want, patients must be always kept in sight of the sentries. A proper enclosure should be made, and ground for exercise provided; but to do this it would be necessary to deviate an existing footpath.

The stairs and passages are of wood; they are low, confined, and narrow.

The wards vary in height from 9 feet 5 inches to 11 feet, which is the highest. They have windows on two adjoining sides, and there is some ventilation by means of auger-holes in the ceiling, communicating with the external air. It is, however, by no means sufficient, and shafts will have to be provided, led up through the ceiling of each ward to the roof of the building.

There are in all 12 wards, six on each side, the accommodation in which, for the east side, is given in the following table, contrasted with what it would be at 1,200 cubic feet per bed :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| Nos. 1 and 2 | 20 | 10 | 10 |
| „ 4 and 5 | 20 | 10 | 10 |
| „ 3 | 6 | 3 | 3 |
| „ 6 | 6 | 2 | 4 |
| Total - - 6 | 52 | 25 | 27 |

This table shows the accommodation on the east side. That on the west side is the same, except that there are two small wards of one bed each.

The total number of beds according to regulation on the two sides would therefore be 106, with an amount of cubic space per bed varying from 466 to 619 feet.

At 1,200 cubic feet per bed, the whole hospital would only accommodate 50 beds, exclusive of the two beds in the small wards.

From deficiency of accommodation, the guard-room has been converted into an itch ward.

There is no authorized accommodation for the sick wives and children of soldiers, but a small ward on the upper floor is at present set apart for them. This want should be supplied.

The staircase and passages are close, and require to be ventilated by a shaft at the top and an inlet for air, or perforated panes of glass in the windows, a stove being provided for warming the air in winter.

There is no lavatory belonging to the hospital, except a back place used for washing linen, where there are metal basins placed on a bench. There is no proper bath-room.

Water is supplied from the citadel works, and also from a rain-water tank. There is a well on the premises, apparently not clean.

Each division of the hospital has a water-closet with one seat, and there is a two-seated privy behind. This latter is drained into a cesspit, and is in a most offensive and noxious condition.

The privies in the yard should be converted into water latrines, the cesspits filled up, and the drainage of the hospital carried into the nearest sewer to discharge into the sea.

The ash-pit is uncovered. An iron barrow, to be emptied daily, should be substituted for it.

The pack-store is in a cellar. It requires additional racks if no better store can be provided.

The bedding and other stores in the basement of the building are described as being all damp and without fireplaces.

The ward windows are stated to be not weather-tight on account of age. The defects are the same in both east and west sides of the building, and require the same remedies.

This hospital might be advantageously extended on a more suitable plan, and with better wards. It is necessary, in fact, that this should be done to afford space for the current sick, as the present wards could only accommodate 50 sick if appropriated according to our instructions; and it is highly probable that as the works are extended the number of men in occupation, and consequently the number of sick, will increase. The situation is a very good one, and wings could easily be thrown out from the present buildings, and better stores could at the same time be provided.

*The following are the Sanitary Improvements immediately required :—*

1. Reduction of numbers of beds, as already mentioned.
2. Ventilation of each ward by a shaft carried up from the ceiling to the roof, with inlets for air near the ceiling properly protected by wire gauze or perforated zinc. Grates to be remodelled to heat the air; also ventilation of the passages and staircase by a shaft and perforated glass panes.
3. Cesspits to be filled up; privies to be converted into water latrines, and to be drained into the sewers.
4. An iron cart to be substituted for the ash-pits.
5. Bath-rooms with baths and hot and cold water, and lavatories adjoining them to be provided.
6. An enclosed exercising ground for convalescents to be provided.
7. Better stores to be provided.
8. Hospital to be extended, and accommodation for the sick of married soldiers' families to be provided.

## 5. DOVER CASTLE BARRACKS.

Dover Castle covers an area of about 70 acres, on a chalk hill, overhanging the sea, and far removed from any source of malaria. It contains three separate sets of barracks; those of Spur Battery, the Keep Yard, and the Cliff Casemates.

*Spur Battery.*

The barrack accommodation in Spur Battery consists of 15 casemates, divided into two stories by a floor, and having windows only at one end, so that there is no thorough ventilation.

The following is the accommodation :—

| Casemates. | Number of Men by present Regulation. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 15 | 245 | 109 | 136 |

It will be seen that there is a very considerable degree of overcrowding in the rooms. Some of them give as little as 240 or 250 cubic feet per man, and the largest cubic space allotted in any of them is no more than 314 cubic feet per man. In their present condition they are dark, wretched, and hardly fit for occupation.

Those on the ground floor are occupied by married soldiers and their families.

Ventilation, so much wanted, could be provided by means of a shaft at the end farthest from the doors

and windows, and by perforated glass panes and an Arnott's ventilator placed in each chimney. These expedients would, however, be at the best unsatisfactory. It would be much better to remove the floor which now divides the casemate into two flats, a measure which would give lofty and improved casemates much more fit for human habitation than the present ones, and the married quarters would have to be removed elsewhere. If this were done the chimneys of the upper flats might be used as ventilating shafts. Remodelled grates for warming the air should also be introduced.

The floors of the lower rooms are of stucco. Proper wooden floors, with ventilation underneath, should be laid.

The privies belonging to these casemates are well constructed; they are flushed every day, and water stands in the trough; between times the water from the ablution-rooms also runs into these privies. The seats require to be divided by partitions, and each compartment should be furnished with a half-door. The urinals have water laid on. There are no baths. The guard-room is gloomy, low, and unventilated.

*We would recommend for these Barracks:—*

1. That the floors dividing the casemates be removed.
2. That the numbers of men in each casemate be reduced, so that every man may have 600 cubic feet of space.
3. That each casemate be ventilated and warmed as described.
4. That the guard-room be ventilated and warmed in a similar manner.
5. That the privies be furnished with divisions and half-doors.
6. That baths be provided. Perhaps the best way of doing this would be to have one bathing establishment for the whole castle, with water laid on, and fixed baths in the proportion of one bath to 100 men.

### Keep Yard Barracks.

These barracks are very defective in structure and in arrangement. They are low-roofed, being mostly from 7 feet 6 inches to 8 feet 10 inches high, irregularly shaped, with the windows at considerable distances from each other, and they are much overcrowded. They are intended to accommodate 246 men, but, as will be presently shown, they have not space for half of this number, even were their structure unexceptionable.

The following table gives the details of the accommodation in the soldiers' rooms:—

| Rooms. | | Present Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|
| No. 6 House. | A | 26 | 11 | 15 |
| | B | 26 | 14 | 12 |
| | C | 26 | 11 | 15 |
| | D | 48 | 25 | 23 |
| No. 7 House. | A | 32 | 18 | 14 |
| | B | 32 | 17 | 15 |
| | C | 32 | 25 | 7 |
| No. 10 House. | D | 19 | 8 | 11 |
| Total - 8 | | 241 | 129 | 112 |

It hence follows that were these barrack-rooms every way suitable for troops, nearly one-half of their present occupants would have to be removed out of them to afford adequate cubic space for the remainder.

Besides being overcrowded, the rooms are dark and unventilated, and the roof of the buildings is old and in bad repair.

The rooms in their present state are quite unfit for occupation by troops. It would cost a large sum of money to make them habitable, and even were this done, they would be so imperfect that it would be most desirable, instead of introducing imperfect improvements, that the whole should be remodelled on better and more healthy principles, a step which would have the great advantage of providing some, at all events, of the additional accommodation so much required in this garrison.

The ablution-room belonging to these barracks is small and dark; it requires ventilation and pegs for the men to hang their coats on. There are no baths.

The officers' quarters and serjeant's mess are about to be removed from their present site, so that it is unnecessary to recommend anything in regard to them.

Two of the privies of the officers' quarters drain into a cesspit, which should be abolished, and the privies converted into water-closets, and properly drained.

The quartermasters' store is too small.

The privies are flushed every day and water stands in them; the urinals are also supplied with water.

There is an open ash-pit, which should be removed, and an iron cart substituted for collecting and removing daily all the barrack refuse.

The school-room and library are dark and unventilated; they require to be reconstructed.

The cook-houses have no means of roasting or baking meat, but in the *enciente* of the castle, in the engineers' stores, there is an old oven which might be made available for baking for a sum of 32*l.* The distance, however, is perhaps too great from most of the barracks, and it would be better to provide every cook-house with a roasting oven.

The women's wash-house is unprovided with a drying stove.

It is intended to build some quarters for married men in the castle *enciente* on the site of the present cook-house and women's wash-house. When this improvement is carried out, it would be very advisable to provide a laundry with the recent improvements.

The water supply is derived from a deep well in the chalk, from which an eight-horse power engine pumps up the water; but there is no water tank, and any accident to the engine or pumps would deprive the garrison of water.

Nothing short of reconstruction will make the Keep Yard barracks suitable for habitation. Until that is done, and if they must be occupied, *we would recommend in the meantime:—*

1. Reduction of numbers of men in each room to the extent laid down above.
2. Ventilation of every barrack-room, school-room, and library, by shafts carried through the ceiling and roof, and by inlets for air. Additional windows to be opened if possible. Fire-grates to be remodelled.
3. Roasting oven to be provided for the cook-house.
4. Ablution-room to be improved, pegs to be provided for hanging coats on.
5. A bath for every 100 men to be provided in the manner recommended above.
6. An iron cart to be provided for removing barrack refuse, instead of the ash-pit.
7. Laundry and drying stove for women's wash-house.
8. Cesspits to be abolished, and drains substituted at the officers' quarters. Latrines require additional ventilation.

### Cliff Casemates.

The Cliff casemates are part of the fortifications, and are specially intended for protection during siege.

They are situated at a great depth underground, in the body of the chalk cliff on which Dover Castle stands. They are reached by descending a well staircase, leading to arched passages, the only means of light and ventilation for which is by vertical shafts cut out of the rock, and the casemates open out of

these dark underground passages. Patent reflectors have been hung at different points, to throw some of the descending light into the passages and casemates, but altogether these rooms, with their swarming inmates, afford a very striking and by no means pleasing contrast, to the splendid new officers' quarters erected in the open air some 150 feet above them.

There are nine casemates in all. Six are short, and three are long. The latter, when entered from the passages, resemble railway tunnels, in which everything is invisible except the light entering at the farther end. These three casemates are 199 feet, 225 feet, and 227 feet long, and they have no direct light, except what proceeds from the openings in the cliff overhanging the sea at the farther end. They are only 16 feet wide, and as there are beds on opposite sides, the distance from foot to foot of the beds, across the casemates, is only 2½ feet. The other six casemates vary from 100 to 104 feet in length, and are lighted in a similar manner.

The two longest casemates have three fireplaces in each, and all the others have two fireplaces. The short casemates are only 10½ feet wide, and hold one row of beds. They are divided into two stories. The whole of them, as already stated, are lighted only at one end by a glazed front facing the sea, the other end abutting upon almost dark galleries and shafts cut in the chalk. The windows in all the casemates facing the sea can be opened, and there are ventilating openings, besides the doors at the other end, so that the shafts, to some extent, act as a means of ventilation. They are places which may be conveniently used for temporary occcupation in a siege, but which are most unfit for permanent residence. For above half their length, the long casemates are so dark that the men can hardly be distinguished on first entering from the light.

The following is the accommodation as compared with what it would be at 600 cubic feet per man :—

| —— | Total Inmates by present Regulation. | Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 6 Short Casemates. | 120 | 87 | 33 |
| 3 Long Casemates. | 294 | 200 | 94 |
| Total - - | 414 | 287 | 127 |

There are urinals and privies also cut out of the rock. They are supplied with water, and the privies are flushed by means of an apparatus worked by a screw, which, from its slowness of operation, prevents the flushing being done with sufficient rapidity. The seats are separated by means of slate partitions. These privies would be greatly improved by a ventilating shaft from the roof, and by louvred windows.

The ablution-rooms are good, but unprovided with baths.

The cook-house has no means of roasting or baking; the only ventilation is by means of louvred windows in front, which is not sufficient. A store is placed at the back in the inner part of the casemate, to which access is obtained from behind.

All these offices are reached by traversing dark gusty passages hewn out of the rock.

The refuse is collected in an ash-pit, which is quite unsuited to such a locality. The ash-pit should be done away with, and an iron barrow substituted, to ensure daily collection and removal of refuse.

The medical officer in charge of the 18th Bedfordshire light infantry states that he has no doubt that these casemated barracks are prejudicial to the health of the men, especially those in the spur. He states that he had more admissions from fever from the casemates in June and July 1858, than in all the previous months of the year in other quarters. That the cases came almost entirely from the spur casemates, and that the cases fell off when the men were removed from them. That all the casemates are damp, more or less, and that rheumatism is prevalent from this circumstance.

Presuming that the intention of these casemates is to afford protection to the men in time of siege, it would be unjust not to state that much attention has been paid to the arrangements necessary for the health and convenience of the inmates. It is no easy matter to combine the requirements for health, with those for defence and protection, in such works ; and in the present case it is most evident that the intention of such a combination has been clearly kept in view. It by no means follows, however, that casemates such as these are suitable for permanent occupation as barracks. We are of opinion that they are not, and that barrack accommodation for the requisite number of men in ordinary occupation should be provided quite independently of these casemates.

Considering them solely with reference to their defensive purposes, *we would recommend the following improvements to be carried out:—*

1. That the long casemates be ventilated by inserting perforated glass panes into the upper portion of all the windows at each end ; by placing a large Arnott's silk flap ventilator in each chimney, and by supplying fresh air from the cliff end by means of a hollow beam, with perforated zinc sides carried along the ceiling.

2. That the kitchen be further ventilated, and a roasting oven be supplied.

3. That means be provided for the daily removal of the refuse, and the ash-pit abolished.

4. That the privy be ventilated, and the means of flushing improved.

Lastly. That until suitable barracks be provided for the men, and all the men removed out of the casemates, the numbers be reduced to the extent specified above.

*The Provost Cells,* eight in number, are placed in a caponière in the ditch of the castle. They are ventilated and heated by air flues from a stove. They are unsuitable for their purpose, and it would be most desirable that good new cells should be built.

*The Guard Room* at the gate of the castle is too small for 15 men who occupy it. It requires ventilation by means of shafts and inlets for air.

A detached picket-house, which is not at present used, is unprovided with either privy or ash-pit.

We would state, in conclusion, that the barrack accommodation of Dover Castle is in a most defective condition, and the whole subject requires to be considered, with the view to its reconstruction and extension. The recommendations we have made in regard to it are, at the best, merely palliative.

It is necessary that they should be carried out in the meantime, but even if they were carried out, we should consider the subject as no less requiring the serious attention of Her Majesty's Government. The present miserable state of all the barracks stands out in marked contrast with the comfort, convenience, and elegance of the officers' new quarters, and what has been done for the officers, who certainly required new quarters as much as the men, should be done in its proper degree for the soldiers also.

### *Dover Castle Hospital.*

The hospital for the garrison sick is an old brick building, situated in front of and below the new officers' quarters. The position is an airy and healthy one, but the building itself is deficient in some important requirements. It is two stories high, and has four large wards, with small wards at the ends, the only entrance to which is through the large wards. All the wards are too low for efficient natural ventilation, although the large wards have windows on both sides. It would be desirable in this case to provide ventilating shafts rising from the ceilings of the wards through the roof, for giving exit to the foul air ; and also inlets for air near the ceilings, and under control of the medical officer, who would

regulate the ventilation according to the state of the weather and force of the wind.

The following, according to the dimensions returned to us, is the present accommodation of this hospital, as contrasted with what it would be if 1,200 cubic feet were allotted to each patient :—

| Wards. | Total Regulation Number of Beds. | Total Number at 1,200 Cubic Feet per Bed. | Total Deficiency in Bed Spaces. |
|---|---|---|---|
| 1, 2, 3, 4 | 72 | 28 | 44 |
| 5 | 2 | 2 | — |
| 6 | 3 | 2 | 1 |
| 7 | 1 | 1 | — |
| Total 7 | 78 | 33 | 45 |

The hospital contains accommodation in these seven wards for no more than 33 beds, at rather less than 1,200 cubic feet per bed. The building requires to be extended to accommodate the present sick, and were the garrison increased in numbers, a corresponding additional increase of the hospital accommodation would be necessary.

There is a water-closet on each floor, constructed within the building, but these water-closets are unventilated, and have no windows to the outer air. They are only lighted and ventilated into the passage by a window opening into the passage. These closets drain into a cesspit immediately behind the hospital, an arrangement which ought to be altered as soon as possible.

Shafts and inlets for air should be at once provided for the present closets, but it would be much better to erect suitable water-closets, bath-rooms, and lavatories outside the hospital buildings, with separate light and ventilation, to fill up the existing cesspool, and to drain the whole buildings to the sea.

The kitchen and scullery are situated at the end of one of the lower wards, and it appears to be the custom to carry all the hospital diets through that ward, as being more convenient than carrying them through the open air outside. It is supposed to be contrary to rule to do so, but no rule will prevent such a thing being done where the convenience is so much greater than carrying the diets outside in all states of the weather.

The kitchen is in fact situated where the lavatories, baths, and water-closets of the ward ought to be. Its cooking arrangements are tolerably good ; it has an oven and an open fireplace, and is considered sufficient.

There is a detached privy behind the hospital, which has a receptacle for water, and is flushed daily. There is a good arrangement at the back, to cause water to flow down constantly by means of a pipe similar to those which supply water to urinals, by which the back is kept clean.

The ash-pit is uncovered ; it should be done away with, and the refuse removed by an iron barrow or cart.

There is no ablution-room, and no bath-room. One ward is used as a bedding store.

The pack store is used also as a provision store, which is objectionable.

We would recommend that this hospital be extended on a plan to include every improvement.

*The following Requirements are necessary for the present Building :—*

1. Reduction of number of beds, as pointed out.
2. Ventilation and warming of wards by shafts and inlets for air, and by remodelled grates.
3. Abolishing the cesspool, and draining the hospital buildings to the sea.
4. Ventilating the present water-closets by shafts and inlets for air, and by a window, until better closets are constructed outside the building.
5. Abolition of ash-pit and daily removal of refuse.
6. Ablution and bath room to be provided.

Proper pack, provision, and other stores, also a room for orderlies, are very much required.

## 6. WALMER BARRACKS.

There are three barracks at Walmer—the South barrack, the Cavalry barrack, and the North barrack. The Royal Naval hospital at Deal, which has been lent for the purpose by the naval authorities, is also at present used as a barrack for infantry.

The whole of these establishments are situated at from 150 to 300 yards from the sea. The military barracks are in open situations, although contiguous to dwelling houses. The Royal Naval hospital, being close to Deal, is nearer the civil population. The whole subsoil of the neighbourhood consists of sand or sandy loam ; porous, and admitting of drainage.

The barracks derive their water supply from the Deal Waterworks Company, by contract, and from rain-water tanks. But the Royal Naval hospital is supplied by pumps.

All the barracks are surface-drained more or less efficiently, but none of them are sewered, although plans and estimates for the work have been already prepared by the Royal Engineers. It is true that the ground is not much elevated above the sea, but the fall to low water, where the sewage could be most conveniently discharged, is quite sufficient.

The absolute want of sewerage and the use of cesspools are sanitary evils common to all these barracks, and nothing effectual can be done in removing the cesspools until proper sewerage works are carried out.

### The South Barracks.

These barracks are constructed of brick, and were built in 1795. The ground within the boundary walls is 10A. 1R. 3P. in area.

They are built in blocks, and there are 23 barrack-rooms, besides attics. Each of the barrack-rooms has four windows, two at each end.

The staircases and landings are of wood, and there is a small room for a non-commissioned officer at the end of each landing, which interferes with the light and ventilation of the staircase.

The barrack-rooms are all occupied beyond the regulation number of men, as will be seen by the following table, which also shows the number which could be accommodated at 600 cubic feet per man :—

| Rooms. | Total Regulation Number of Men. | Total Actual Number. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Regulation Accommodation. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|---|
| 7 | 133 | 147 | 105 | 28 | 19 | 15 |
| 8 | 136 | 160 | 104 | 32 | 17 | 13 |
| 8 | 128 | 136 | 96 | 32 | 16 | 12 |
| Total 23 | 397 | 443 | 305 | 92 | — | — |

The regulation accommodation exceeds the available accommodation at 600 cubic feet per man by 92 men ; but the number actually in the barrack-rooms when the return was sent us exceeded the regulation number by 46, and it exceeded the accommodation at 600 cubic feet per man by 138 men. This latter number shows the extent of overcrowding at the time the return was made.

The rooms are light, but not very lofty. The ceilings are covered with perforated zinc. The floors of some of the rooms are not in good condition. There are no means of ventilation in the rooms, except doors, windws, and fireplaces.

To remove this defect, shafts should be carried up from the ceiling of each room to the roof of the building, and fresh air ought to be admitted into the rooms by means of openings close to the ceilings, or between the zinc lining and the floor above; perforations being made through the zinc to allow the outer air to enter the room.

There is a circular cook-house, provided with boilers and an oven; but the oven is not ventilated and no roasting tins have been provided, so that the oven is of no use.

The ablution-rooms have no ventilation. To remedy this defect shafts should be carried up through the roof and the windows fitted with perforated glass. There are no gratings for the men to stand on, and no baths.

There is an ash-pit for which an iron cart and daily removal of refuse should be substituted.

The urinals and privies are not supplied with water. The seats of the privies are covered with flaps, but there are no divisions, and as all the soil is received into a common cesspit the effluvia are very offensive, and would be more so were it not that a shaft is carried up from each cesspit to a height of from 14 to 18 feet, which diffuses the emanations at a certain elevation above the ground.

There is a wash-house with tubs, but no proper laundry. There is no day-room. The library is too small. There are no covered sheds for drill. The sleeping accommodation for non-commissioned officers is very limited. The serjeants' mess is very small, and has no kitchen. There is no sufficient accommodation for pursuing trades.

The surface drainage of the barrack area runs to the sea through drains, which have a very small fall.

The abolition of cesspits is indispensably necessary to the sanitary improvement of these barracks, and would necessitate an entirely new arrangement for the drainage, which must then, as has been stated, be carried below *low*-water mark, because the shingle moves so considerably between high and low-water mark as to render it impossible to maintain a drain clear which discharges between the two.

In the attics there are quarters for 24 married people. They are not sufficiently ventilated, and there are no suitable divisions between the beds.

The sewerage of these barracks ought to be carried out according to the plan and estimate already made by the Engineering Department with as little delay as possible.

As soon as this is accomplished all the cesspits in the barracks ought to be filled up, and the privies converted into water latrines.

The guard-room and lock-up both require ventilation through the roof. At present they are unventilated.

*We would recommend:—*

1. That the numbers in the barrack-rooms be diminished, so that every man may have 600 cubic feet of space.

2. That every barrack-room be ventilated by a shaft and inlet for air, as recommended; that the guard-room and lock-up be similarly ventilated; and that the married quarters be also ventilated through the roof.

3. That the projected sewerage of the barracks be completed, the whole of the cesspits filled up, and the privies converted into water latrines, with means of flushing, and with divisions of seats and half-doors. That the urinals also be supplied with water.

4. That the kitchen arrangements be completed, so that the ovens may roast meat, and that suitable cooking tins be provided for this purpose.

5. Ablution-rooms to be improved and ventilated as described. Gratings for the men to stand on to be provided. A bath-room and baths in the proportion of one bath to 100 men to be provided.

6. Ash-pits to be abolished, and iron carts, with daily collection and removal of refuse, to be introduced.

7. Laundry to be improved and drying stove provided.

8. Barrack-rooms to be lit with gas, by ventilated burners.

A day-room and drill shed ought also to be constructed.

### Cavalry Barracks.

These barracks are situated close to the South barracks, and were erected in 1794 to accommodate 74 men, but they are almost unoccupied at present. The ground on which they stand is 3A. 1R. 22P. in extent, and is of the same general character as that already described.

They are constructed of brick, on the same principle as the Hounslow and Windsor Cavalry barracks, viz., with the barrack-rooms over the stables, and with the entrance to the barrack-rooms from a dark central passage which runs from one end to the other of the building, having a window at each end. The doors in these rooms open close to the fireplaces.

The rooms have openings for ventilation in the ceilings into the space under the roof; but this arrangement is not sufficient; they require ventilation by means of shafts from the ceiling and separate inlets for air protected by perforated zinc.

The following table shows the accommodation:—

| Rooms. | Regulation Number of Men. | Accommodation at 600 Cubic Feet each. | Deficiency in Accommodation in Men. |
|---|---|---|---|
| 6 | 54 | 42 | 12 |
| 1 | 6 | 5 | 1 |
| 2 | 8 | 6 | 2 |
| 1 | 4 | 3 | 1 |
| 10 | 72 | 56 | 16 |

The present barrack-rooms are therefore set apart by regulation for 16 men more than they can accommodate, at 600 cubic feet per man.

There is a garret above the barrack-rooms which might be adapted for the men removed from the lower rooms if it were properly ventilated and better lighted. The stables also should be ventilated by means of shafts carried up through the roof, and by perforated glass placed in the windows.

The cook-house is in one of the compartments allotted to stables. There is no oven or means of roasting meat.

There is no ablution-room, but one has been authorized; baths are however not included.

The women's wash-house has no drying stove or proper laundry.

The privies drain into cesspits underneath, from which a shaft is constructed to conduct away and diffuse the effluvia into the atmosphere; the seats have flaps, but no divisions or doors. They were very offensive and require reconstruction and conversion into water latrines.

The ash-pit is uncovered; it should be removed and a cart should be substituted.

There is in the enclosure a room used temporarily as an infant school.

The guard-room is not ventilated.

*The chapel school* is a new building which stands on an open piece of ground; it should be enclosed by a proper fence or railing. It appears to be ventilated, but the upper ventilators are small for the cubic contents of the building.

*The following are the Sanitary Improvements we would advise for these Barracks:—*

1. Reducing the regulation number of men as already stated.

2. Ventilation of every barrack-room and also of the guard-room by a shaft from the ceiling, and by inlets for air near the ceiling.

3. Ventilation of the stables by shafts carried from the ceiling to above the roof of the building, with perforated glass windows for admitting air.

4. Drainage of the whole barrack, and the sub-

stitution of a water latrine with divisions and half-doors, in place of the present privy.

5. A roasting oven to be supplied to the cook-house.

6. Suitable ablution and bath room, with one bath to be provided.

7. A drying stove to be placed in the women's wash-house.

### The North Barracks.

These barracks were erected in 1797, and consist of three blocks, connected by a broad arched corridor, which joins them together on the ground floor ; two blocks are used as soldiers' quarters, and the third is the hospital.

The buildings are of brick and stand in an area (including the hospital burial ground) of 9A. 3R. 30P. The ground has the same general characteristics as it has in the other barracks.

The structure of this barrack is very superior, as far as regards health, to almost any other we have seen. The rooms are lofty. They have seven windows in each. They are light and airy, and well adapted for their purpose.

Each block is three stories high, and is traversed by a central passage and staircase, from which access is given on each floor to a room on either side of the landing, occupying the whole length of the building, and having windows both on the side and at the two ends.

At the end of each passage, in the barrack part, is a small room occupied by a non-commissioned officer. One of these rooms has been appropriated to a library. Rooms for the non-commissioned officers have also been partitioned off on the landings.

These rooms require to be ventilated by means of shafts and inlets for air.

The following table shows the amount of accommodation in soldiers' rooms in the two barrack blocks :—

| Rooms. | Total Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 4 | 124 | 92 | 32 | 31 | 23 |
| 4 | 152 | 116 | 36 | 38 | 29 |
| 4 | 132 | 100 | 32 | 33 | 25 |
| 3 | 18 | 18 | — | 6 | 6 |
| 2 | 10 | 8 | 2 | 5 | 4 |
| 17 | 436 | 334 | 102 | — | — |

The barrack-rooms in one block only were occupied when the return was made to us.

It will be seen that the regulation accommodation exceeds the available space at 600 cubic feet per man by 102 men, a number for which additional barrack accommodation will have to be provided.

The cook-houses are situated between the blocks. One cook-house is appropriated to the barracks. They open out of the corridor on the ground floor.

The cook-house appropriated to the barracks is provided with boilers and an oven, but as the oven is not ventilated, it is not adapted for roasting meat.

There are no proper workshops in any of the barracks at Walmer, the rooms which might be appropriated to shops being appropriated for stores, of which the depôt battalions each require one.

The ablution rooms in the North barracks have no gratings for the men to stand on, and there are no baths. These latter should be provided in the proportion of one to every 100 men the barracks can accommodate. The present ablution-room requires ventilation by a shaft from the ceiling, and by perforated panes in the windows.

The privies require reconstruction and conversion into water latrines, but to do this the whole barrack must be sewered, as already mentioned.

The urinals are not supplied with water and are very offensive.

The women's wash-house is in a decayed wooden building ; it has no drying stove, and is only ventilated into a barrack store. The condition of this wooden building renders is questionable how far any improvement in it is possible.

The guard-room is close, and requires ventilation by means of a shaft from the ceiling, and inlets for air.

These barracks are not lighted by means of gas.

*The following are the Sanitary Improvements we would recommend for the North Barracks :—*

1. The sewerage of the entire building to be carried out to low-water mark. The abolition of all cess-pits, and the drainage of all water-closets, privies, sinks, &c., into the sewers.

2. Reconstruction of the privies into water latrines, with divisions and half-doors, and with means of flushing, and reconstruction of urinals with water supply.

3. Ventilating each barrack-room by the largest size Arnott's silk flap ventilator into the chimney, and by a perforated glass pane at the top of each window.

4. Library and non-commissioned officers' rooms to be ventilated.

5. Ablution-room to be improved, and bath-room, with baths in the proportion of one bath for 100 men, to be provided as stated above.

6. Oven in the cook-house to be improved by ventilation, to admit of meat being roasted in it.

7. Wash-house to be repaired, and suitably provided with utensils and a drying-stove, or a new one to be built.

8. Guard-house to be ventilated, as described.

### *Hospital, Walmer.*

The eastern block of the North barracks is used for a hospital, and one room of the centre block is also appropriated as a ward.

There is no separation between the hospital entrance and the rest of the barracks, so that soldiers and convalescents can easily come together. There is a court behind the hospital in which a small garden, or exercising ground, has been laid out for convalescents. The walk of this garden should be paved or asphalted, and covered seats put in for the patients.

The following table shows the ward accommodation in this hospital at present, and what it would be at 1,200 cubic feet per bed :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet per Bed. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| Medical - | 20 | 15 | 5 |
| Venereal - | 20 | 15 | 5 |
| Surgical - | 20 | 12 | 8 |
| Ophthalmic | 20 | 12 | 8 |
| Fever - | 6 | 3 | 3 |
| Infectious | 4 | 2 | 2 |
| Refractory | 3 | 2 | 1 |
| Itch - - | 6 | 3 | 3 |
| | 99 | 64 | 35 |

At 1,200 cubic feet per bed, as near as may be, there is accommodation in this building for 64 beds, and no more.

The wards require remodelled fireplaces on account of the great waste of heat. It would be desirable that, in reconstructing them, a brick chamber separated from the fire should be reserved behind each fireplace, into which air should pass directly from the outside, and be admitted into the room after being warmed. A shaft should be carried up in one corner, from the ceiling through the roof, and a large Arnott's silk flap ventilator should be put into each chimney. Inlets for air near the ceiling should also

be provided, by inserting a perforated glass pane into the top of each window, both shafts and inlets being provided with a means of closing under the control of the medical officer.

On the staircase small wards have been partitioned off from the landings. These should be at once removed. They interfere with the light and ventilation of the stairs and passages. Perforated panes should be placed in the windows, which would then be opened to the staircase.

A shaft, of about 1 foot 6 inches square, should be led up from the ceiling of the staircase through the roof, and a fire-brick stove provided on the ground floor, with a chamber arranged to receive air directly from the outer air, to be warmed before its entrance to the staircase.

The water-closets open immediately out of the wards; they should be provided with double doors, and with perforated panes, and shafts from the ceiling through the roofs for ventilation.

The itch ward is in the yard. It requires ventilation by means of a shaft from the ceiling and inlets for air; a means of closing both under the control of the medical officer being provided.

There is no ward for prisoners, and consequently when a prisoner is sick a sentry mounts guard over him to the disturbance of the other patients.

There are no rooms for the orderlies.

The baths and ablution-rooms are good.

The privies are as good as privies draining into a cesspit can be.

The ashpit should be done away with, and an iron barrow or cart substituted.

The pack store opens into the yard, and appears sufficient.

It would be an improvement to provide a scullery and laundry, both of which are wanting.

*The following are the improvements required for Health in this Hospital:—*

1. Sewerage, as in the other buildings. Abolition of cesspits, and converting privies into water latrines.
2. Reduction of numbers of beds, as recommended.
3. Ventilation of wards by shafts and inlets for air, and improvement in fireplaces, as suggested. Also ventilation of water-closets.
4. Removal of small wards from staircases, and ventilation of staircases as suggested.
5. Abolition of ashpit, and daily removal of refuse.
6. Hospital to be separated from barrack by a suitable enclosure.

## 7. NAVAL HOSPITAL, DEAL.

This building was lent by the Admiralty to the War Department, for the purpose of a barrack, in November 1857. As the building is in temporary occupation, it is only necessary to state generally that it is overcrowded with men, that the wards or rooms are not ventilated, that there is no sewerage, and that it is not supplied with water from the town works, but from a well in the yard, at no great distance from most offensive privies and cesspits. There are good baths in it, which the men are not allowed to use. This restriction should be removed.

The privies alluded to are very objectionable. They empty into a cesspit, and the opening through which the cesspit is cleared is only covered by an ill fitting wooden top.

Additional ventilation, both by a shaft from the cesspit, and by shafts and inlets for air in the privy, would improve them; but to be made satisfactory, the privies require thorough reconstruction, and sewerage works similar to those recommended for the barracks.

The water supply is pumped up by manual labour. It would be very desirable that water should be obtained from the water company which supplies the town, as the cesspools are much too close to the well to be safe.

The guard-room is dark and unventilated.

If this building is to be used for any length of time, it will be necessary to improve the sewerage, to convert the privies into water latrines, to ventilate the rooms by shafts and inlets, as already recommended for the other barracks, to reduce the number of men, so as to give 600 cubic feet per man, and to obtain a proper water supply.

## 8. CANTERBURY BARRACKS.

These barracks occupy an inclosure of nearly 31 acres in area, situated at the outskirts of the town of Canterbury, in an open airy position, with the ground sloping gently towards the river, about 200 yards distant. The subsoil consists of clay, or brick, earth, and gravel. It is not self-draining, and some portions of the surface are soft and wet in wet weather.

There are four barracks within the inclosure, viz.:—

The Cavalry barrack, built in 1795.
The Artillery barrack, built in 1802.
The North Gate barrack, built in 1803.
And the permanent Infantry barrack, built in 1806.

All the buildings are constructed of brick, and adjoin each other.

### The Cavalry Barrack.

This barrack consists of a long range of buildings of the usual construction. The stables are on the basement, and above them are two ranges, back and front, of barrack-rooms, with an intervening gloomy corridor of considerable length, having a window at each end.

The arrangement of barrack-rooms over stables we have objected to in our previous reports, and we shall merely repeat the objection here. In all future barracks it would be very advisable, wherever practicable, to follow the example of the Maidstone cavalry barrack, and place the men and horses under separate roofs, at a distance from each other.

The barrack-rooms are of the usual construction. They contain too many men, and are imperfectly ventilated by apertures in the ceilings, opening into the attics, but without any direct communication with the external air.

The following is the accommodation in the soldiers' rooms:—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation per Man. |
|---|---|---|---|
| 30 | 270 | 240 | 30 |

Each room gives accommodation for nine men, according to the present regulation. By removing one man from each room, 30 men in all, a cubic space of not much less than 600 cubic feet per man will be given.

Above the barrack-rooms are extensive attics, partly used as barrack-master's stores, partly as workshops. These workshops are all defectively ventilated, and are apt to become oppressively hot. This latter defect would be much diminished by improving the ventilation.

Besides diminishing the number of inmates, these barrack-rooms require ventilation by shafts carried up from the ceiling of each room to the roof, and by separate inlets for air, protected by perforated zinc, near the ceiling. During winter, the fresh air admitted might be warmed, by being made to pass through a fire-brick chamber behind, or at the sides of the fireplace, before being admitted into the room. The corridors require lighting and ventilation by large skylights at intervals in the roof, and by plastered shafts, the width of the corridor, rising to them from the ceiling of the corridor.

The stables have zinc ceilings, and four ventilators, one at each corner ; but each stable ought to be ventilated above the roof by a shaft, to carry off the fumes, and by perforated glass in the windows.

As is usual in many cavalry barracks, the yard in rear of the barracks is narrow and confined, and is further contracted by washhouses, kitchens, urinals, and ash-pits. It would be a great advantage to reconstruct these offices at a greater distance from the barracks, by taking a piece of ground from the sick horse field adjoining.

The only places for cleaning are at the bottom of the stairs, leading up to the barrack-rooms. There is one cleaning-room in Canterbury barracks, but it is at present used as a butcher's shop, and proper cleaning sheds are stated to be much wanted.

The privies consist simply of cesspits without drainage, and they are in a very offensive state, although great pains have been taken to improve them, as far as their radically defective structure will admit.

Nothing effectual can be done without a thorough drainage of the whole establishment, and a sufficient water supply.

At present the water is obtained from wells in the barrack yard. The supply is not sufficient for an establishment of such magnitude ; the wells are too close to the privies and cesspits, and other provisions should be made for supplying the whole barracks with water without delay.

The dung-heaps are placed at a sufficient distance from the soldiers' quarters, but the ashpits are too close to the quarters, and should, in fact, be removed altogether, and iron carts substituted, with daily removal of barrack refuse.

The cook-house is supplied with boilers, but has no means of roasting or baking meat.

The lavatory has no gratings for the feet, nor pegs for hanging coats on.

There are no bath-rooms nor baths.

The urinals are in the open air, and uncovered above. They should be roofed over.

The wash-house has no drying-stove.

The guard-room of the Cavalry barracks is small, and requires ventilation by a roof ventilator.

The canteen is a miserable place, and is far too small for so large a number of men.

### Royal Artillery Barracks.

This barrack is situated between the Cavalry and Infantry barracks, and has regulation accommodation for 225 men, exclusive of non-commissioned officers.

The rooms are mostly eight feet high. Some are lighted with one window, others with two, but there are no sufficient means of ventilation.

They are much overcrowded, as may be seen by the following table of accommodation :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 3 | 45 | 21 | 24 | 15 | 7 |
| 8 | 120 | 80 | 40 | 15 | 10 |
| 4 | 60 | 48 | 12 | 15 | 12 |
| 15 | 225 | 149 | 76 | — | — |

The deficiency of accommodation amounts to one-third of the whole.

Two of the upper rooms receive part of their light and air from windows into a staircase, or short corridor, and are unusually close, and often offensive from this error in construction, by which the foul air of other barrack-rooms is admitted into them instead of fresh air.

The ablution house has neither gratings nor pegs, and there is no proper drainage.

Boilers are the only means of cooking provided for the men in this barrack.

The privies are open to the same objection as those in the Cavalry barracks. They require drainage and reconstruction, with an abundant supply of water.

### The North Gate Barracks.

This barrack contains 21 men's rooms, with regulation accommodation for 420 men, exclusive of non-commissioned officers. The rooms vary in height from 8 feet 8 inches to 10 feet 8 inches, and from 16 to 44 feet in length.

The men's rooms have two or three windows each. A berth for a non-commissioned officer is placed in each room, which covers the light of one window.

There are openings for ventilation in the ceilings of the rooms, but they are not sufficient, and each room requires to be separately ventilated by a shaft and inlets for air, in the way already mentioned for the other barracks.

The staff-serjeants' quarters require ventilation by Arnott's silk flap valve.

The wash-house has no drying-stove, and no gratings for the women to stand on. It is not sufficiently ventilated.

The privies are in a very bad state, as well as the urinals, and require reconstruction.

These barracks are overcrowded, as the following table of accommodation shows :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 7 | 140 | 91 | 49 | 20 | 13 |
| 8 | 160 | 120 | 40 | 20 | 15 |
| 6 | 120 | 96 | 24 | 20 | 16 |
| 21 | 420 | 307 | 113 | — | — |

The accommodation is therefore deficient about 25 per cent.

### Permanent Infantry Barracks.

The barrack-rooms in these barracks are in two blocks, two stories high, in each of which there are three sets of rooms. The rooms open out of a passage, and have windows on two sides.

There are hollow beams with openings into them along the ceilings, which afford some ventilation to the rooms. The lower sash of each window opens on pivots, but the upper sash, which is the most important for ventilation, does not open.

There is no accommodation for married soldiers, and hence some of the soldiers' rooms have to be appropriated to them.

The other rooms are overcrowded, and require the numbers of the inmates to be reduced as follows :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 41 | 820 | 533 | 287 | 20 | 13 |

There is hence a deficiency of accommodation of above 30 per cent.

The privies of these barracks, like those of all the

others, are most offensive, and require drainage and reconstruction.

The ash-pit is also in an unwholesome condition, and ought to be altogether removed and an iron cart substituted.

The ablution-rooms are small. There is one behind each block. They have no gratings for the men to stand on. The ablution-table is of slate, but there is no ledge to prevent the water running on the men when washing. There are no baths.

The cook-house has no oven or means of roasting. It requires additional ventilation in the roof and perforated panes in the windows.

The guard-rooms, lock-up rooms, and cells of these barracks are all deficient in ventilation.

It would be a great advantage to have one prison and lock-up for the whole barrack, instead of a number of separate cells in different parts of it.

The barrack-master's stores are also scattered over the barracks, and the department would be improved by having proper stores built in a convenient locality.

An old hospital in the square of the cavalry barrack has been set apart for married quarters. It is a miserable place in its present state, and the whole of the basement is unfit for human habitation.

The privies and ash-pits of this place are in a very bad and unwholesome state.

We are of opinion that the basement rooms should not be occupied ; that the privies should be converted into water latrines ; that the ash-pit should be entirely removed, and that the rooms occupied by families should all be ventilated by an Arnott's silk flap ventilator.

Properly constructed married quarters are much wanted for these barracks.

### *Canterbury Hospital.*

This hospital is situated in an open airy locality, at a convenient distance from the barracks, and without any population near it.

The building consists of a central part, with a corridor running along one side of it, with the wards entering from the corridors, and consequently receiving direct light and air only on one side of the building. There are two slightly projecting wings, the wards of which have windows on two sides.

The hospital is in two divisions, A and B, one for cavalry the other for infantry, and most of its administrative arrangements are in duplicate.

Each division has 76 beds, with upwards of 700 cubic feet of space to each.

The following table exhibits the ward accommodation in one division of the hospital, as contrasted with what it would be at 1,200 cubic feet per bed :—

| Wards. | | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|---|
| Basement | 1 | 8 | 5 | 3 |
| | 2 | 8 | 5 | 3 |
| | 3 | 8 | 5 | 3 |
| 1st Floor | 4 | 8 | 5 | 3 |
| | 5 | 8 | 5 | 3 |
| | 6 | 4 | 2 | 2 |
| | 7 | 8 | 5 | 3 |
| 2nd Floor | 8 | 8 | 5 | 3 |
| | 9 | 8 | 5 | 3 |
| | 10 | 8 | 5 | 3 |
| Total - 10 | | 76 | 47 | 29 |

The other division of the hospital affords the same extent of accommodation. There are thus in all 20 wards and 152 beds in the building.

In order to set aside 1,200 cubic feet per bed, as required by our instructions, it would therefore be necessary to remove 29 beds out of each division, or 58 beds in all, leaving 94 beds as the available accommodation.

Several of the arrangements of this hospital are very defective. There are no water-closets. There is no proper drainage or water supply. The only conveniences for the sick are most offensive privies over cesspits in the back yard, and which can be reached only by walking across a very rough, ill-paved footway exposed to the weather.

At no great distance from the privies is the pump, described as being difficult to work, which supplies the hospital with water.

There is a wash-house with one 34-gallon boiler.

The kitchens, though conveniently situated and connected with the hospital by a roofed passage open at the sides, have imperfect cooking arrangements.

The pack store is in the basement, and is reached by passing through the coal cellar. It is of course damp and dark.

There are no bedding or other stores.

There are no lavatories.

There are no baths.

There is no itch ward, although one is necessary for the numerous recruits sent to these barracks.

There is an ash-pit too close to the hospital.

The whole hospital is lit by candles.

The hospital is not sufficiently cut off by an enclosure from the adjoining ground, a defect which leads to sundry irregularities.

The ventilation of the wards is provided for by swing sashes in the upper part of the windows, and by a perforated beam passing across the ceiling. It is not sufficient, and might be readily improved by ventilating shafts carried up from the ceilings to the roof.

Before proceeding to state the sanitary improvements required for these barracks, it is necessary to express our opinion strongly on the necessity of immediately removing the fundamental defects we have already adverted to in the drainage and water supply.

Within the barrack walls there is a population of some 2,000 men, women, and children, besides horses, without any efficient means for removing the fluid refuse produced by them.

The area has cesspits all over it, with wells dug in the same soil, and also ash-pits in all degrees of offensiveness. The privies are all of them abominable, and require to be entirely reconstructed : and yet not one effectual step can be taken to accomplish these needful improvements until the entire area occupied by the barracks and hospital is properly drained.

It would be perfectly possible to obtain an abundant supply of good water from the hill close to and above the level of the barracks, a step which must accompany the execution of any drainage works. The water might be obtained from a well and pumped up to a tank, from whence it might be easily distributed over the entire barracks and hospital.

The outlet for the barrack drainage is into a stream which passes within a few hundred yards of the boundary. This stream receives the present drainage of the city of Canterbury ; and although the addition of the latrine drainage of the barracks, thrown into it as it would be once a day, might not add materially to the pollution of the stream, we should, nevertheless, think it desirable to have the barrack drainage deodorized, unless it could be applied to the irrigation of neighbouring grass land, as all such drainage ought to be.

We have been informed that plans for the drainage and water supply have been drawn out, and that the total estimated cost is 10,000*l*., of which 3,000*l*. was proposed this year, but struck out of the annual estimate.

Taking it for granted that the proposed works of drainage and water supply ought to be carried out, which they ought to be without delay, otherwise the necessary drainage improvements are impracticable,—

*We would recommend, as applicable to the whole Establishment, Barracks, Married Quarters, and Hospital :—*

1. That the cesspits be all abolished and filled up.
2. That all privies be converted into water latrines, with proper water supply, divisions of seats and half doors, and flushed out once a day.
3. That all urinals be properly constructed and supplied with water.
4. That all ash-pits throughout the establishment be abolished, and a service organized by which the whole barrack refuse may be collected in iron carts and removed daily.
5. That every cook-house in the barracks be supplied with means of roasting or baking meat.
6. That bath-rooms and baths, in the proportion of one bath for every 100 men, be provided in some convenient locality ; that a sufficiency of foot-pans for cleanliness be also provided and supplied with water; and that gratings and pegs be provided in the ablution-houses.
7. That all the wash-houses be supplied with drying-stoves, places for ironing linen, and gratings to stand on.
8. That cleaning-rooms, day-rooms, and drill sheds be provided.
9. That the guard-rooms be ventilated by shafts and inlets for air.

Lastly, it would be very advisable to light the whole barrack and hospital with gas.

These requirements are applicable throughout the establishment, and ought all to be carried out. There are others besides which refer more especially to individual barracks, and these are as follow :—

*Cavalry Barracks.*

1. To remove one man from each barrack-room, and provide other accommodation for the 30 men so removed.
2. To ventilate every barrack-room by a shaft carried up from the ceiling to above the roof of the barrack, and to provide inlets for fresh air, through a perforated zinc cornice, for each room near the ceiling.
3. To light and ventilate the corridor by opening large ventilating skylights in the roof of the building, and carrying up a plastered shaft the width of the corridor from its ceiling to the skylight above.
4. To ventilate, by louvred turrets, all the workshops in the attics, and to increase their light.
5. To put a roof over the urinals, and to supply them with water.
6. To ventilate the non-commissioned officers' rooms and the married quarters by an Arnott's silk flap valve into each chimney. All window sashes to be made to open at top, and a perforated glass pane to be introduced into each window.
7. Stables to be ventilated by a shaft carried from the ceiling to above the roof of the building, and by perforated glass in the windows.

*Royal Artillery Barracks.*

The improvements required specially for this barrack, besides those already enumerated, are :—

1. Providing additional accommodation for 76 men to be removed from the rooms, and allotting 600 cubic feet for the remainder, as near as may be.
2. To ventilate all the rooms by shafts carried up from the ceilings to above the roof, and by inlets for air, through perforated zinc, near the ceilings. To provide additional light in the darker rooms.

*North Gate Barracks.*

1. To remove 113 men from these barracks, and to allot, as near as may be, 600 cubic feet per man for the remainder.
2. To ventilate each room by a shaft and by inlets for air in the manner already mentioned, and to provide additional light where necessary.

*Permanent Infantry Barracks.*

The following are the additional sanitary improvements required for these barracks :—

1. Accommodation to be provided for 287 soldiers, the present excess of occupants of the rooms, and 600 cubic feet per man to be allotted, as near as may be, to the remainder.
2. Ventilation of each room by a shaft from the ceiling.

*Hospital.*

1. Water-closets, lavatories, and bath-rooms to be provided for each flat.
2. Existing privies to be converted into water latrines and drained.
3. Each ward to be ventilated by a shaft from the ceiling, and the air to be warmed by remodelling the grates.
4. A cubic space of 1,200 cubic feet, as near as may be, to be set apart for each patient, and 58 beds to be removed from the wards.
5. Suitable means of washing the hospital linen to be provided instead of the present wash-houses, which might be conveniently added to the kitchen.
6. Proper kitchen ranges and boilers for cooking diets to be provided.
7. Pack store, bedding store, and provision store to be provided.
8. An itch ward to be provided.

We have the honour to be, &c.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, Oct. 15, 1858.*

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## PORTSMOUTH DISTRICT.

SIR,

IN compliance with our instructions, we have inspected and made inquiry into the state of the barracks in the Portsmouth district, with special reference to the points on which we were required to report, and we have now the honour to do so as follows.

We have inspected the following barracks and hospitals in this district :—

1. Anglesey barracks, Portsea.
2. Royal Engineer barrack, Portsea.
3. Colewort barracks.
4. Cambridge barracks.
5. Clarence barrack.
6. Fort Cumberland.
7. Point battery.
8. Blockhouse fort, Gosport.
9. Fort Monckton, Gosport.
10. Haslar barrack and hospital, Gosport.
11. Garrison hospital, Portsea.
12. Winchester barrack and hospital.

And we proceed to give the details in regard to each separately.

### 1. ANGLESEY BARRACKS, PORTSEA.

This barrack is of recent erection, and stands upon 5A. 2R. 12P. of ground. Being built within the lines, it is situated on low ground, and in the immediate

vicinity of the dwellings of the civil population. The building contains 53 barrack-rooms, all of which, at the time of our inspection, were fully occupied up to the regulation number of 18 men per room.

The whole barrack has regulation accommodation for 954 men. The rooms are nearly of a size, and give an average space of about 489 cubic feet per man.

The following is the present accommodation as compared with what it would be at 600 cubic feet per man :—

| Number of Rooms. | Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 53 | 954 | 794 | 160 | 18 | 15 |

From the dimensions of the rooms it is impossible to apportion the cubic space exactly at 600 cubic feet per man, without leaving a considerable balance ; but the number 160 represents nearly the excess of present inmates over the accommodation at 600 cubic feet per man.

The barrack-rooms are built back to back, with windows only on one side.

The rooms are tolerably well lighted, with the exception of those at the back on the ground-floor, which are rather dark, on account of the interception of light by the corridor.

These rooms have no sufficient means of renewing the air for so large a number of men. There is only an opening for ventilation into each chimney, 9 inches long by 3 inches broad, protected by a valve. The current of air passing into this opening is variable, and smoke sometimes issues from the opening into the room ; but even if the plan acted fully, the aperture would not by any means afford sufficient egress for the foul air of the room. The guard-room is not sufficiently ventilated.

There is no day-room, and there are no baths belonging to the barrack.

The privies, both in the barracks and officers' quarters, are without water for flushing, and are drained into cess-pits, which are periodically emptied by contract. The urinals are in the same yard with the privies, and have no water for cleansing.

The kitchens are supplied with boilers, but have no means of roasting or baking meat.

The ablution-rooms are good, but there are no wooden gratings for the men to stand on. The floors being asphalted are usually damp and wet.

The lower rooms of the barracks have likewise floors of asphalt, which is an objectionable material for such a purpose.

At about 40 yards' distance from the barracks are special quarters for 60 married soldiers. They consist of 60 rooms in five blocks of rooms of three floors ; each room is intended to accommodate a family, and has a capacity of 1,680 cubic feet.

Attached to this building is a very complete laundry, with other conveniences.

The ventilation of the rooms being dependent entirely on the opening of the doors and windows, cannot be considered sufficient for the limited cubic space for the members of a family, and should be improved by introducing air-bricks.

*The following are the Sanitary Improvements required for Anglesey Barracks:—*

1. Reduction of the number of men in every barrack-room by giving 600 cubic feet per man. To do this it will be necessary to remove somewhere about three men out of each of the rooms.

2. Ventilating every barrack-room by a shaft carried from the ceiling of the room through the roof, and protecting the upper end of the shaft by louvres. At the same time fresh air to be admitted by openings near the ceiling, and diffused through wire gauze or perforated zinc, as recommended for the London barracks.

3. Ventilation of gas burners by a tube into the chimney.

4. Cess-pools to be entirely abolished. The privies to be converted into water latrines, with flushing arrangements, and drained direct into the sewers. Divisions between the seats, and half-doors to be provided. Privies in officers' quarters to be converted into water-closets.

5. Urinals to be improved and supplied with water for cleansing.

6. A cooking stove, with means for roasting and baking meat, to be provided for the kitchen.

7. Ablution-rooms to be provided with wooden gratings for the men to stand on.

8. Baths to be provided in the proportion of one to 100 men.

9. Guard-room to be ventilated.

10. Ash-pit to be reduced in size to contain one day's ashes only, and to be covered ; but it would be better to collect and remove the ashes daily in an iron cart.

11. School-rooms and library to be ventilated.

Besides these requirements for health, it would be very desirable to provide a day-room for the men.

## 2. ROYAL ENGINEER BARRACK.

This is a small barrack, not far from the preceding, standing on 3R. 33P. of ground, with regulation space for 99 men.

It has three barrack-rooms, the accommodation in which is as follows :—

| Rooms. | Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation. |
|---|---|---|---|
| 1 | 33 | 24 | 9 |
| 2 | 33 | 33 | — |
| 3 | 33 | 33 | — |
| 3 | 99 | 90 | 9 |

There is no misappropriation of rooms. There are no special means of ventilation for any of the rooms. There is no day-room, school-room, library, baths, nor laundry.

The kitchen is supplied with baking oven and four boilers.

There is no cleaning-room.

The rooms are lighted with candles.

Water is obtained from the water company.

There is no special sleeping accommodation or mess for non-commissioned officers.

Gratings are required in the lavatory for the men to stand on while washing.

There is a latrine with a cesspit attached, which is emptied by contract.

The hospital of this barrack has the means of thorough lighting and ventilation. The space up to the rafters is taken into the wards, which have, moreover, windows on both sides. The upper sashes of windows are on pivots, and can be opened as much as may be required.

This barrack is small, isolated from other buildings, and contains very few men, which circumstances ought to be taken into account in improving it.

*The following we consider the necessary Requirements for Health :—*

1. Removing nine men from No. 1 room, and ventilating each room with upcast shafts and apertures for admitting fresh air.

2. Abolishing the cesspit, and providing a proper water latrine with drainage and flushing arrangements.
3. Gratings for men to stand on while washing.
4. A bath to be provided. It would be advantageous to light the rooms with gas.

## 3. COLEWORT BARRACKS.

There are in this case two barracks within the same enclosure, one for artillery and the other for infantry. The whole establishment stands on 3A. 0R. 37P. of ground.

### Royal Artillery.

This barrack occupies one side of the same square in which Colewort infantry barracks are situated. It is an old building, with some of the rooms low in the ceiling, in proportion to their length and breadth, and the structure generally is not well adapted for thorough ventilation.

The barrack is scheduled to accommodate 185 men.

The following are the details of the accommodation :—

| Rooms. | Regulation Number of Men. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation. |
|---|---|---|---|
| No. | | | |
| 1 | 24 | 20 | 4 |
| 2 | 28 | 26 | 2 |
| 3 | 28 | 22 | 6 |
| 4 | 24 | 14 | 10 |
| 5 | 30 | 26 | 4 |
| 6 | 30 | 22 | 8 |
| 7 | 21 | 14 | 7 |
| 7 | 185 | 144 | 41 |

This barrack, therefore, contains 41 men more than the accommodation would admit of, at a little more than 600 cubic feet per man. The number 144 represents approximately the number of men the building might safely hold.

There is no misappropriation of rooms, for all are occupied by men.

The ventilation generally is very imperfect throughout the building.

There are no day-rooms, baths, drying stove, cleaning room, or covered shed for drill.

The water supply is obtained from pumps and rain-water tanks.

The privies are of the ordinary construction, and without water for flushing ; they are emptied by night carts.

There is no mess accommodation for non-commissioned officers.

The kitchen is provided with iron boilers, but has no other means of cooking meat.

*The following are the Requirements for Health in this Barrack :—*

1. Reduction of numbers in the proportions per room given above, and allotting 600 cubic feet per man.
2. Ventilation of every room by a sufficient number of upcast shafts from each room, and providing the means of admitting a sufficiency of fresh air near the ceiling of each room.
3. Cesspools to be abolished and proper water latrines with drainage and flushing apparatus to be introduced.
4. Baths to be provided.
5. Drying stove for the laundry to be provided.
6. Kitchen to be provided with means of roasting and baking meat.

### Infantry Barracks.

This is a very old barrack, surrounded by houses of the civil population.

It contains 14 barrack-rooms, 8 of which are 9 feet high, and 6 are only 8 feet high. Each room is intended to accommodate 17 men, and the following are the details :—

| Rooms. | Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 1, 2, 5, 6, 11, 12 | 102 | 48 | 54 | 17 | 8 |
| 4, 7, 8, 9, 13, 14, 15, 16 | 136 | 72 | 64 | 17 | 9 |
| Total - | 238 | 120 | 118 | — | — |

The inmates of the 9-feet rooms have 338 cubic feet per man, while those in the 8-feet rooms have only 300 cubic feet per man. The regulation accommodation is for 238 men.

Each room has four small windows, some of which are 6 feet high, some 4 feet 9 inches high, and in six rooms the windows are only 3 feet high.

There are no means of ventilation for these rooms, except by small openings above the fire-place, and by the windows and doors.

The rooms were close and offensive at the time we inspected them.

They are lit with candles.

There is no day-room.

The library for the troops in Portsmouth is situated in Colewort barracks.

The school-room is low-roofed, without ventilation, and noisy from being under the barrack-rooms.

There is no shed for drill.

The laundry is provided with two coppers and a bench. Water is not laid on, and there is no drying stove.

The kitchen is provided with boilers, but has no provision for roasting or baking meat.

Water is obtained from the Farlington Water Company, and from a pump. Rain-water is also collected for use.

The privies are dark and noisome, and not drained nor supplied with water. They are emptied by night carts.

There is no grating for the men's feet in the ablution-room.

There is a small bath-room partitioned off from the lavatory, but it contains only one slipper bath. There are four foot baths in the lavatory itself.

Colewort barrack is old and very defective in many respects. It is, as a whole, a very unsuitable building for its purpose. But it has one good point in its structure, that of dividing the range of buildings into separate blocks, which admits a freer external circulation of air. We should not advise much money to be spent on it, but so long as the building is occupied, there are certain conditions necessary for ensuring the health of the men, which ought to be secured as far as possible.

*The following are the Requirements for Health :—*

1. One-half of the men ought to be removed out of the barrack, and 600 cubic feet per man allotted in each room.
2. The barrack-rooms and school-rooms should be ventilated by air-shafts and apertures for admitting air near the ceiling. Guard-room also to be ventilated.
3. Barrack to be drained, and the privies to be connected with the drains, supplied with water, and converted into water latrines.
4. Kitchen to be provided with roasting oven.
5. Proper bath accommodation to be provided.
6. The ash-pit ought to be covered, or, still better, removed altogether, and iron carts used for removing daily the whole barrack refuse.

7. Laundry to be improved, and a drying stove provided.

We have made these recommendations in order to make the building somewhat better adapted for barrack purposes; but if sufficient accommodation can be found elsewhere for the men it contains, the best thing to do with the present barrack would be to convert it into married quarters, for which it would be much more suitable than it is for its present purpose.

It would be desirable, were it practicable, to prevent the public having access to the yard attached to these barracks. There is unfortunately a right of way across the yard, which opens a door for irregularities of various kinds.

## 4. CAMBRIDGE BARRACKS.

These barracks are situated in the centre of the town, and part of them has been recently rebuilt upon a better plan and scale than the older barracks. They stand on 3A. 0R. 7P. of ground.

### *New Barrack.*

The rooms of this new part are spacious and light; they are 11 feet 9 inches high, and have each three windows 6 feet 9 inches in height by 3 feet 6 inches in width. The chief structural defect of these rooms is that they are built back to back, with windows only on one side, so that there is no cross ventilation. Each pair of back to back rooms communicates by air bricks through the party wall close to the ceiling, but these openings are of no use in ventilating the rooms, on account of the distance between the opposite windows, which is about 44 feet.

There are 26 barrack-rooms in the new building, and each room, with two exceptions, accommodates 18 men by regulation. In the other two rooms there are 17 men in each. The total accommodation in the new building is, therefore, set apart by regulation for 466 men, with a space per man of from 500 to 542 cubic feet.

The following table gives the details :—

| Rooms. | Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 1, 2, 4, 15, 16, 17, 18 | 125 | 112 | 13 |
| 5, 9 | 36 | 30 | 6 |
| 3, 13, 14 | 53 | 45 | 8 |
| 6, 7, 8, 10, 11, 12, 19 to 26 | 252 | 224 | 28 |
| Total 26 | 466 | 411 | 55 |

The space allotted in this new barrack is a great advance on the existing regulation in many other barracks, but it is not enough. In order to comply with the requirements in our instructions, it will be necessary to remove 55 men to other quarters, to give the required space of 600 cubic feet per man.

### *Old Barracks.*

The old part of Cambridge barracks is much behind the newer portion in arrangements. There are in it 26 barrack-rooms, containing from 17 to 26 men in each, with a cubic space per man varying from 372 to upwards of 550 cubic feet.

The following is the accommodation by regulation in each room, with the deficiency of accommodation at 600 cubic feet per man :—

| Rooms. | Regulation Number of Men. | Number at 600 Cubic Feet per Man. | Deficiency of Accommodation. |
|---|---|---|---|
| No. | | | |
| 2 | 20 | 12 | 8 |
| 3 | 20 | 13 | 7 |
| 4 | 20 | 13 | 7 |
| 5 | 20 | 15 | 5 |
| 6 | 20 | 15 | 5 |
| 7 | 20 | 12 | 8 |
| 8 | 20 | 14 | 6 |
| 9 | 20 | 14 | 6 |
| 10 | 17 | 13 | 4 |
| 11 | 21 | 12 | 9 |
| 12 | 21 | 15 | 6 |
| 13 | 20 | 12 | 8 |
| 14 | 20 | 13 | 7 |
| 15 | 26 | 16 | 10 |
| 16 | 23 | 16 | 7 |
| 17 | 20 | 14 | 6 |
| 18 | 19 | 12 | 7 |
| 19 | 23 | 20 | 3 |
| 20 | 20 | 17 | 3 |
| 21 | 19 | 12 | 7 |
| 22 | 22 | 16 | 6 |
| 23 | 24 | 16 | 8 |
| 24 | 24 | 17 | 7 |
| 25 | 22 | 17 | 5 |
| 26 | 23 | 20 | 3 |
| 27 | 22 | 20 | 2 |
| Totals 26 | 546 | 386 | 160 |

We have divided the cubic space as nearly as may be into portions of 600 cubic feet per man, and it appears that by existing regulations there are 546 men in the space sufficient for 386, and consequently 160 men ought to be removed out of these old barrack-rooms.

The rooms are, moreover, not well adapted for their purpose; they are low ceiled in proportion to their area. Many of them are rather gloomy although they have windows on opposite sides, and they have no proper means of ventilation.

Cambridge barracks are partly lit with gas, partly with candles.

They are supplied with water partly by the water company, partly from rain water.

The privies require to be converted into water latrines, with the means of flushing into the drains.

The slate tables of the lavatory require a raised edge, to prevent the water running off and wetting the men.

There are no gratings for the men to stand on, nor pegs for hanging coats, &c.

There is no bathing accommodation. (We are informed that, since our inspection, baths have been authorized, and that gratings and pegs have been placed in the lavatory.)

The ashpit is large and open. It should either be contracted and covered, or the whole dust and refuse be deposited in an iron cart, and removed once a day, which would be preferable.

The kitchen has no means of cooking, except boilers.

These barracks have no day-room, school-room (the room now used is a barrack-room), no library, cleaning-room, drill shed, or married people's quarters.

*We would recommend the following Improvements to be carried out in Cambridge Barracks:—*

1. Removal of two men out of each room in the new building.

2. Reduction of numbers in the old building to the extent pointed out.

3. Ventilation of every room in both buildings, and also of the guard-room, by air shafts and inlets. Ventilation of gas burners into the chimney.

4. Converting privies into water latrines, with means of flushing.

5. Improvement of ashpit, or if possible, daily removal of refuse in the way pointed out.

6. Roasting and baking apparatus to be provided for kitchen.

The other deficiences ought also to be supplied, but those indicated above appear to us to be the most immediately necessary for health.

## 5. CLARENCE BARRACK.

This is an old badly constructed barrack, situated in a filthy, close, and ill-ventilated portion of the town of Portsmouth. It is built in closed squares, an arrangement by which the circulation of air is still further impeded.

It stands on 1A. 3R. 6P. of ground.

The barrack consists of two wings, the right and left wing.

In the former there are 51 barrack-rooms, and in the latter there are 14, the whole giving accommodation for 912 men.

The rooms vary considerably in size.

In the right wing they are from 7 feet 9 inches to 10 feet 6 inches in height. The majority being about 10 feet high. In the left wing their height varies between 10 feet 6 inches and 15 feet.

The majority of the rooms in the right wing are 24 feet 6 inches long by 18 feet broad. There is one room 82 feet long, 18 feet 6 inches wide, and only 9 feet high.

The rooms in the left wing are 41 feet 6 inches long, by 22 feet broad.

The general appearance of these rooms is that of close, low, dirty, ill-lighted, and ill-ventilated apartments, and there is an air of discomfort in most of those we entered.

There are no means of ventilation, except the doors and small windows.

Only in the upper rooms have any attempts at ventilation been made, and these are most unsatisfactory.

All the barrack-rooms are lit with candles.

The following is the allotment of the accommodation in Clarence barrack :—

| Rooms. | Regulation Number of Men. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation. |
|---|---|---|---|
| Right Wing. | | | |
| 1 - - | 19 | 15 | 4 |
| 2 - - | 20 | 25 | — |
| 3 to 6 - | 78 | 56 | 22 |
| 7, 8 - | 36 | 26 | 10 |
| 9 to 13 - | 64 | 55 | 9 |
| 14 - - | 12 | 9 | 3 |
| 15 - - | 15 | 12 | 3 |
| 16 - - | 14 | 11 | 3 |
| 17 - - | 15 | 9 | 6 |
| 19, 20 - | 16 | 12 | 4 |
| 21, 22 - | 20 | 16 | 4 |
| 23, 24 - | 18 | 16 | 2 |
| 25, 26 - | 16 | 12 | 4 |
| 27, 30 - | 36 | 32 | 4 |
| 31, 32 - | 14 | 12 | 2 |
| 33, 36 - | 36 | 28 | 8 |
| 37, 38 - | 14 | 14 | — |
| 39, 40 - | 16 | 14 | 2 |
| 41 - - | 8 | 7 | 1 |
| 43, 44 - | 14 | 10 | 4 |
| 45 - - | 8 | 7 | 1 |
| 46, 47, 48 | 27 | 21 | 6 |
| 49 - - | 8 | 6 | 2 |
| 50, 51 - | 16 | 14 | 2 |
| 52 - - | 14 | 11 | 3 |
| 53 - - | 30 | 23 | 7 |
| Left Wing. | | | |
| 1 - - | 24 | 23 | 1 |
| 2 - - | 24 | 17 | 7 |
| 3, 4 - | 48 | 46 | 2 |
| 5, 6 - | 48 | 34 | 14 |
| 7 - - | 24 | 16 | 8 |
| 8 - - | 16 | 13 | 3 |
| 9 to 12 - | 96 | 92 | 4 |
| 13, 14 - | 48 | 32 | 16 |
| Totals 65 | 912 | 746 | 171 |
| Deduct excess of accommodation in No. 2 room, right wing - - - - - - | | | 5 |
| | | | 166 |

From this table it appears that all the barrack-rooms except right wing, No. 2, are overcrowded. No. 2 room has five fewer men than it would hold.

The total regulation number of men is 912, but the total available accommodation at 600 cubic feet per man is for 746 men, leaving an excess of 171 — 5 = 166 men, as representing the amount of overcrowding in the barrack.

The water supply of this barrack is derived partly from rain water, and partly from the public water-works.

The buildings are drained only into cesspools.

The privies were very offensive at the time of our inspection ; they are situated on one side of the court, close to one of the kitchens, and the effluvia from them pervaded the kitchen while the cooking was going on. They are emptied by contract. Nothing could be worse than was the condition in which we found them.

Privies, ash-pits, and urinals were all filthy, and the whole require reconstruction and drainage.

The kitchen referred to above is a small, confined, dark apartment, 10 feet high, damp, partly below the level of the court, and close to the privies as already stated.

It is supplied with boilers, but has no other means of cooking.

There is no bath-room, no day-room, no covered shed for drill.

The laundry has coppers, but no other fittings.

There is a school-room for adults, and another for infants.

A room is occasionally used as a library.

There are 12 small rooms for staff and other serjeants, but there is no accommodation for married soldiers.

Clarence barracks are as a whole in very bad condition, and much of the structure hardly admits of improvement. The buildings in their present state are not suited for barracks, and the best thing to do would be to provide others and vacate them.

As this cannot be done at once, *we consider it to be essentially necessary to carry out the following Improvements* :—

1. Reduction of numbers in the barrack-rooms to the extent already stated.
2. The ventilation of every barrack-room, guard-room, and school-room, by shafts carried up through the ceiling to the roof of the building, fresh air being at the same time admitted and diffused near the ceiling.
3. Sewerage of the barracks, and the abolition of cesspools.
4. Reconstruction of privies, and the introduction of water latrines with flushing apparatus, and division of seats and half-doors.
5. Reconstruction of urinals, with water laid on.
6. Abolition of ashpits. There is no place in these barracks where refuse can be safely retained. Iron carts to collect and remove the refuse daily are required.
7. Kitchen to be provided with roasting apparatus.
8. Additional supply of baths in a suitable room, with water laid on.
9. Laundry to be supplied with fittings, and with a proper drying closet, or drying stove.

## 6. FORT CUMBERLAND.

This fort is situated close to the sea, and has accommodation for 621 men. It covers an area of 7A. 1R. 33P.

The parade of the fort is level with the ordinary spring tides, and the ditch is 4 feet below them. Spring tides have been known to rise two feet above their ordinary level. These circumstances render the drainage of the fort a matter of difficulty.

The barracks are all casemated, and were at the

time of our inspection chiefly occupied by the Royal Marine Artillery.

Thirty-one of the casemates are used as barrack-rooms. They are from 38 to 40 feet in length, about 14 feet broad, and 9 feet 4 inches high. Each casemate has one fireplace in the middle of its length. From the structure of the casemates the windows are placed at each end of the rooms; they are small and low, and not sufficient for ventilation, especially at night.

The number of men in each room is, in the majority of cases, 17; in a few it is 21 and 29. The cubic space per man is, in the majority of instances, 248½ cubic feet; in a few it is a little less or a little more; in all it is very insufficient; but this defect, and also the structural deficiencies in the means of ventilation, are to a certain extent counterbalanced by the airy and exposed position of the fort.

The following accommodation is deficient in these barracks :—

Day-room, library, baths, cleaning-room, and shed for drill.

There are no means of roasting or baking meat in the kitchens.

The privies have open soil-pits emptied by night carts. They are very noisome.

They are drained into a cesspit in the ditch, the surface of which is occasionally overspread by sewage water, and is supposed lately to have occasioned several cases of fever in the fort. The ablution-room is dark and damp. The guard-room is without any opening at the back, and is, in consequence, close and unventilated.

There is a hospital belonging to Fort Cumberland, situated in the middle of the ground. It requires ventilation.

In our opinion casemated barracks should, as far as possible, be kept for defensive purposes, and they should not be occupied by men to the same extent as might be necessary during a siege.

We make no scruple, therefore, in advising a large reduction of numbers in the casemates at Fort Cumberland, by allotting 600 cubic feet per man. At this rate the following table shows a comparison between the existing accommodation, and what it ought to be for health :—

| Rooms. | Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation. | Present Number of Men in each Casemate. | Proposed Number of Men in each Casemate. |
|---|---|---|---|---|---|
| No. | | | | | |
| 1 - - | 21 | 9 | 12 | 21 | 9 |
| 7 and 10 - | 42 | 16 | 26 | 21 | 8 |
| 11 and 32 - | 58 | 22 | 36 | 20 | 11 |
| 24 and 27 - | 58 | 24 | 34 | 29 | 12 |
| 26 remaining rooms. | 442 | 182 | 260 | 17 | 10 |
| Total 33 - | 621 | 253 | 368 | — | — |

At 600 cubic feet per man the 33 occupied casemates would hold no more than 253 men, and, deducting two casemates, used by the officers' messman, and by the serjeant's mess, the accommodation would be 253, minus 14, equal to 239 men.

*We recommend therefore :—*

1. That the numbers be reduced to the extent mentioned.
2. That each casemate, including the guard-room, be ventilated by an air-shaft, and by openings for supplying fresh air through perforated zinc at each end of the casemate.
3. That the privies be converted into water latrines, with self-discharging apparatus at low tide.
4. That a better ablution-room be provided.
5. That the kitchen be supplied with the means for roasting and baking.
6. That the hospital wards be ventilated by air-shafts and inlets for fresh air near the ceiling.

## 7. POINT BATTERY.

The barrack in this battery consists of four casemates, each 37 feet 8 inches long, 19 feet broad, and 12 feet 9 inches high. Each casemate holds 20 men, with 456 cubic feet per man. There is one window and one door to each room, and there are at present no other means of ventilation.

The following is the accommodation :—

| No. of Casemates. | Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 4 | 80 | 60 | 20 |

The casemates are situated in a circumscribed area, in an angle of the works, and there is no space on which to construct conveniences. There is no accommodation for married non-commissioned officers or soldiers. There is no cleaning-room.

The latrines are emptied by night carts.

The lavatory has no water laid on. It has to be carried from the pumps. There is no bath.

The kitchen has no means of cooking except by boiling.

*We recommend the following Improvements :—*

1. To give 600 cubic feet per man by removing five men out of each casemate.
2. The rooms to be ventilated by means of a shaft; fresh air being admitted through perforated zinc, at the ends of the casemates.
3. The kitchen to be provided with a small range, containing a roasting oven.
4. A water latrine and flushing apparatus is required instead of the present unwholesome privy.
5. A bath should be provided, and water laid on to the lavatory.

## 8. BLOCKHOUSE FORT, GOSPORT.

This fort is situated in an open, airy position on the western side of the entrance to Portsmouth harbour, and encloses within its walls 5A. 0R. 21P. of ground.

The barrack accommodation consists of five casemates, occupied by artillerymen, and two casemates occupied by staff serjeants. Each casemate is 32 feet 5 inches long by 27 feet 2 inches broad, and 13 feet 5 inches high to the summit of the arch. The regulation number of men in each casemate is 18, giving 650 cubic feet per man, and the casemates accommodate 92 men in all. At the time of our inspection the rooms were occupied by 17 men each. The casemates have each two windows and a fireplace.

The cubic space allowed for the men is sufficient; the casemates are spacious and lofty; but they might be improved in their ventilation by admitting air at each end, and providing an outlet for it by a shaft near the centre.

The kitchen is too small. It is provided with boilers, but has no other means of cooking rations. The water supply is derived partly from wells, partly from rain-water.

Blockhouse fort is deficient in the following accommodation :—

Library, day-room, school-room (there is one proposed), baths, laundry, cleaning-rooms, covered shed for drill, and workshops.

There is no separate accommodation for sleeping and mess of non-commissioned officers.

The privy is dark, and was noisome at the time of our inspection. It is only flushed at spring tides.

It would be a great improvement to convert this privy into a water latrine, and to flush it out daily.

*The Improvements we would recommend for Blockhouse Fort are the following :—*

1. Ventilation of casemates, as already mentioned.
2. A small cooking range to be provided for the kitchen This would enable the present boilers to be removed, and would give additional space in the kitchen.
3. A bath to be provided.
4. Privy to be converted into a water latrine, with flushing apparatus, and to be flushed daily.

## 9. FORT MONCKTON, GOSPORT.

The area of Fort Monckton within the glacis is 12A. 1R. 17P.

The barracks consist partly of casemates and partly of rooms constructed above them.

There are 11 casemated rooms occupied by privates, and two casemated rooms are used by staff serjeants. One is occupied as a tailor's shop. Each casemate is 28 feet long, 12 feet wide, and 9 feet 2 inches high to the crown of the arch, and contains about 2,800 cubic feet of space. The regulation number of men in these rooms is nine men per room, with an allowance of about 313 cubic feet of space per man. At the time of our inspection they were occupied by seven men each. The rooms have only one small window, 2 feet 6 inches high. These windows are hung folding, and, with the door and fire-place, constitute the only means of ventilation.

The rooms above the casemates are somewhat better suited for their purpose. They are 19 in number, one of which is intended for a library. With two exceptions, they contain less than 2,700 cubic feet each. The two largest rooms have a capacity of 5,968 and 6,755 cubic feet respectively. All the smaller rooms accommodate, by regulation, nine men each, except one which holds eight men. The two large rooms accommodate 18 and 20 men.

The cubic space per man in all the rooms, with one exception, is under 300 feet, and in the exceptional case it is 375 cubic feet per man. The total accommodation by the present regulation, in the occupied rooms of Fort Monckton, is therefore as follows :—

| | Regulation Number of Men. | Number at 600 Cubic Feet each. | Deficiency of Accommodation. |
|---|---|---|---|
| Casemates - 11 | 99 | 44 | 55 |
| Upper Rooms, except Nos. 15 and 20 - 17 | 152 | 68 | 84 |
| Nos. 15 and 20 - 2 | 38 | 21 | 17 |
| Total - 30 | 289 | 133 | 156 |

There are neither day-room nor baths in these barracks, and there is no covered shed for drill.

The ablution-room is too small.

There is no special ventilation in any of the rooms.

The privies are dark and very noisome, and require to be removed from their present position, in the body of the building, under the rooms, to the inmates of which they are very offensive, owing to the soil being only precariously washed away by the tide.

The kitchen is situated in an excellent building, but has no means of cooking, except boiling.

The water supply is derived from fresh and salt water pumps, and is considered sufficient.

The drainage is very defective, and requires careful examination and reconstruction. At times, the tide flows over part of the square, and, at the period of our inspection, foul water was lying in the gutters, directly under the windows.

There is no accommodation provided for married non-commissioned officers and soldiers, and as the regulated number of wives accompany the regiment in occupation, they have to be put into any place that can be found for them. The quarters occupied by women and children, when we were at Fort Monckton, were very bad, and certain of them unfit for human habitation.

Much inconvenience is experienced for want of a serjeants' mess.

*The following Improvements we consider necessary for these Barracks :—*

1. Reduction of numbers in the casemates from nine men to four in each. This will give more than 600 cubic feet per man, but five men would be too many, and that number would have less than 600 cubic feet per man.

In the rooms above, the numbers should be reduced from nine to four in the smaller rooms ; from 18 to 11 in room No. 15 ; and from 20 to 12 in room No. 20.

2. Ventilation of each casemate by a large square Arnott's valve into the chimney. The air being admitted by the inlet, at either end, covered with perforated zinc.

For the upper rooms, a ventilating shaft from each room, to be carried from the ceiling to the roof, and air to be admitted by openings, protected by perforated zinc, near the ceiling, and at a distance from the shafts.

3. Improvement in the drainage of the fort.
4. Removal of privies from their present site, and the construction, in a more suitable locality, of water latrines with means of daily flushing, and with divisions of seats and half-doors.
5. Kitchen to be provided with means of roasting and baking meat.
6. Wash-house to be provided with a laundry stove.
7. Two baths to be provided.

Lastly, it would be very advisable to provide some accommodation for a serjeant's mess, and also for soldiers' families, as the present accommodation is wholly inadequate.

## 10. HASLAR BARRACK, GOSPORT.

Haslar barrack covers an area of 5A. 0R. 1P., and consists of six detached blocks one story high, well separated from each other, with one large and two small rooms in each, containing 21 and 13 men, by regulation, respectively.

There are, in all, 23 barrack-rooms occupied by soldiers. One room is occupied by the serjeant-major and one by the quartermaster-serjeant.

The barrack-rooms are of three dimensions. No. 1 room in each of the six blocks has 10,484 cubic feet of contents, and accommodates, by regulation, 21 men, giving to each man 499 cubic feet of space.

Rooms Nos. 2 and 3 in each of the blocks hold 13 men each, with 507 cubic feet per man, and the rooms No. 4 hold 13 men each, with 499 cubic feet per man. Each block, with one exception, accommodates 60 men, so that the men are barracked in six separate buildings, which is a most excellent arrangement so far as concerns their health. The total regulation accommodation in the six buildings, exclusive of non-commissioned officers, is for 346 men.

Haslar barrack is deficient in baths, laundry (there is only a wash-house), and covered shed for drill.

There are no means in the kitchen of baking or roasting meat.

The sewage flows into cesspools, and the drainage is defective.

The privies require much improvement.

The school-room is good, but not well ventilated.

All the barrack-rooms require ventilation, which could be very easily carried out through the roof.

The ashpit is badly placed.

The ablution-house is dry, light, and spacious.

There is no special accommodation in these barracks for soldiers' wives.

The chief defect in the men's rooms of this barrack is want of ventilation, otherwise the principle on which the barrack is constructed, namely, that of quartering the men in a number of separate buildings, at a good distance from each other, gives it great advantages for health. Under such an arrangement, and considering the exposed airy position of the barrack, it is not necessary to set aside such an amount of cubic space per man as we have had to recommend in town barracks of the ordinary construction.

With proper ventilation the present number of men might be accommodated with safety, provided there were some re-arrangement whereby the space could be more equally distributed.

*We would recommend the following Improvements in this Barrack :—*

1. Ventilation in every barrack-room, by louvred turrets in the roof, and means of admitting fresh air near the ceiling. School-room to be similarly ventilated.
2. Abolition of all cesspools, and direct drainage to the sea.
3. Removal of privies to a better site, and their reconstruction as water latrines, with divisions of seats and half-doors.
4. Kitchen to be provided with means of baking and roasting meat.
5. Three baths to be provided.
6. Ashpit to be placed at a greater distance from the buildings, and more frequently emptied.

Lastly, it would be advisable to provide quarters for married non-commissioned officers and soldiers, and a mess-room for non-commissioned officers. Also a drying stove for the wash-house.

*Haslar Barrack Hospital.*

This hospital is built like an ordinary dwelling-house, and stands on ground somewhat lower than the barrack. It is not in very good repair, and requires improvement in some essential particulars.

It contains four wards and four nurses' rooms, which latter are not occupied by the orderlies ; for, contrary to every sound principle, the orderlies sleep in the wards, and thus occupy ward space which is required for the sick.

Each ward accommodates, by regulation, 10 sick, with a cubic space varying from 640 to 740 cubic feet, as follows :—

| — | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet. | Deficiency in Bed Spaces. |
|---|---|---|---|
| Wards 1, 2 | 20 | 12 | 8 |
| „ 3, 4 | 20 | 10 | 10 |
| 4 | 40 | 22 | 18 |

There is no lavatory attached to the building, and the sick wash in the wards.

There is no slipper bath. There is one shower bath not in repair.

The washing is done in the barrack wash-house.

The kitchen is supplied only with coppers for boiling diets.

The water supply of the hospital, like that of the barrack, is derived from a well.

There are no waterclosets in the hospital ; there are only close stools, and privies outside ; the drainage is defective.

The wards have each a ventilator in the ceiling, but, as there is no proper inlet for the air, the current in the ventilator is down in place of up, and causes draughts.

There is no accommodation for the sick of soldiers' families.

*This Hospital requires for Improvement :—*

1. Reduction of number of inmates, to give 1,200 cubic feet of space for each bed.
2. Ventilation, by shafts from the ceiling of each ward, with means of introducing fresh air near the ceiling.
3. A proper lavatory and bath-room.
4. Water-closets, with proper drainage to the sea.

Lastly. Orderlies to sleep out of the wards ; and, if practicable in the present buildings, accommodation for the sick of soldiers' families to be provided.

## 11. GARRISON HOSPITAL, PORTSEA.

This hospital was constructed to accommodate 316 sick. It is built across the opening of one of the bastions, in a situation which though, perhaps, as good as was to be had within the lines, is objectionable, on account of the want of free circulation of air round the building.

It stands on 2A. 2R. 30P. of ground.

The hospital consists of three flats. There is an open corridor running along the front, on the three stories, looking to the south-west, and from which doors open into passages leading to the wards. These passages are connected through the whole height of the building by internal wooden staircases.

The hospital is divided into what are called four "houses," A, B, C, and D, and it contains 25 wards. Twenty-two of these wards are no more than 11 feet high, and the other three wards are only 9 feet 11 inches high. The other ward dimensions vary considerably. Fourteen wards are 48 feet long by 22 feet broad, and have 11,616 cubic feet of contents. They contain 17 sick each. Eight wards are 21 feet 7 inches long, six of these are 20 feet broad, and two 22 feet broad, with six sick in each. Two wards are 25 feet 10 inches by 22 feet, with nine sick in each, and one ward is 28 feet long by 22 feet broad, with 10 beds. The smallest amount of cubic space per bed is 611 cubic feet, and the largest 791. The average is about 698 cubic feet.

The following table shows the present ward accommodation as contrasted with what it ought to be with 1,200 cubic feet of space set apart for each bed :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation for Sick. |
|---|---|---|---|
| A House 1 - | 6 | 3 | 3 |
| 2, 4, 5, 7 | 68 | 40 | 28 |
| 3, 6 - | 12 | 8 | 4 |
| B House 1, 2, 5 | 51 | 30 | 21 |
| 3, 6 - | 19 | 10 | 9 |
| 4 - | 7 | 4 | 3 |
| C House 1, 2, 3 | 51 | 30 | 21 |
| 4 - | 7 | 4 | 3 |
| 5 - | 9 | 5 | 4 |
| D House 1 - | 6 | 3 | 3 |
| 2, 4, 5, 7 | 68 | 40 | 28 |
| 3, 6 - | 12 | 8 | 4 |
| Total 25 - | 316 | 185 | 131 |

Ten of the largest wards have four windows, each 6 feet 6 inches high by 3 feet 11 inches wide. Two of these windows are placed at each end of the ward, with a fireplace between them. The distance between the opposite windows is 48 feet, and the beds are arranged along the dead walls. Four of the largest wards have six windows in each. Of the

smaller wards some have two and some three windows in each, with one fireplace. Three wards are misappropriated for hospital serjeant's rooms, as there is no other accommodation for them.

The means of natural ventilation by doors and windows are exceedingly defective in this hospital, on account of its construction. In most of the wards the window space is too small for the cubic contents, and we are not aware of any hospital in which the distance between opposite windows is so great as in this. It is 18 feet more than is the distance in the best constructed hospitals. The wards are too low in proportion to their other dimensions. It would be difficult to ventilate the larger wards, even by open windows, unless there was a considerable movement in the outer atmosphere. To supply this defect ventilating openings have been made in the floors and ceilings, communicating with the external air, and chimney valves have been introduced; but all are under the command of the men, and consequently closed, and with all these appliances, therefore, the ventilation is very deficient.

The hospital has patent self-acting water-closets and urinals to each flat, well placed beyond the outer wall of the building, and properly ventilated, the drainage of which is conveyed away in earthenware pipes and barrel drains, trapped, and not passing under the main building, and is discharged into the sea.

Detached from the hospital is a latrine, drained into a cesspool, with an overflow pipe.

The lavatory is situated in an imperfectly lighted room on the ground-floor, and is very inferior in its arrangements to the lavatory in the hospital of the Scots Fusilier Guards in Westminster.

There is no bath-room and no suitable bathing accommodation.

The kitchen is good and well provided with cooking apparatus.

The water supply is derived from a water company, and is received into tanks.

The laundry arrangements appear sufficient.

The chief sanitary defects of this hospital are overcrowding and imperfect ventilation, to which must be added want of suitable baths and lavatories, and the existence of a privy and cesspool within the precincts of the building.

*We are of opinion that the following Improvements are requisite:—*

1. Reduction of the number of beds in all the wards, as laid down in the preceding table, which will give in some wards a little more, and in some a little less, than 1,200 cubic feet per bed.

These changes, proposed in accordance with our instructions, would necessitate the removal of 131 beds out of the building.

2. We propose to light and ventilate all the staircases through the roof. In order to obtain the means of supplying fresh air to the middle of the wards, which cannot be done at present, we would propose to make a sufficiently large ventilating opening into each ward, over or near the top of the door, provided with means for diffusing the air; also to make additional openings, with means of diffusing the air through the external walls where necessary; and to carry up ventilating shafts in suitable positions from the ceiling of each ward through the roof of the building. The air in the lobbies and staircases might be warmed, if necessary, by stoves in cold weather.

3. A suitable bath-room should be provided, with hot and cold water laid on.

4. Lavatories to be improved.

5. Cesspool to be removed, and the privy connected with it to be converted into a water latrine to be flushed into the sewers.

## 12. WINCHESTER BARRACKS.

Winchester barracks are situated in a dry, elevated, airy position, and are included in an area of 15A. 1R. 25P. of ground. They consist of one large building, with officers' quarters partly within it and partly detached.

The barrack is traversed by wide lofty passages, out of which open small courts containing the kitchens. The barrack-rooms are on four floors, including the ground floor, and are entered from a corridor within the building, which extends down each side, and is lighted from the courts by ordinary windows. The various flats of barrack-rooms are reached by wooden stairs inside the building, each stair communicating with all the floors.

There are in all 119 barrack-rooms, having very nearly the same superficial area to each room, but varying in height between 9 feet 6 inches and 13 feet 9 inches; and as all the rooms contain the same number of men by regulation, namely, 14, the cubic space per man varies considerably in the different rooms.

The following is the arrangement of the accommodation:—

There are 12 barrack-rooms on the ground floor; on the first floor there are 33 rooms; on the second floor there are 34 rooms; on the third floor there are 40 rooms.

The building has regulation accommodation for 1,666 men. The amount of cubic space per man varies in each floor; it is 464, 354, 375, and 339 cubic feet in the floors, beginning from the ground upwards.

The accommodation, according to the present regulation, as compared with what it would be at 600 cubic feet per man, is as follows:—

| — | Rooms. | Regulation Number of Men. | Number at 600 Cubic Feet per Man. | Deficiency of Accommodation. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|---|
| Ground Floor | 12 | 168 | 132 | 36 | 14 | 11 |
| 1st Floor | 33 | 462 | 297 | 165 | 14 | 9 |
| 2nd Floor | 34 | 476 | 306 | 170 | 14 | 9 |
| 3rd Floor | 40 | 560 | 320 | 240 | 14 | 8 |
| Totals | 119 | 1,666 | 1,055 | 611 | — | — |

There is, therefore, a deficiency of accommodation for 611 men. In reducing the numbers it would be necessary to remove three men out of every ground-floor room; five men out of each first-floor room; five men out of every second-floor room; and six men out of every room on the top floor.

Ventilation is provided for in this barrack by swing windows, and by ventilating beams perforated with holes. If the number of men in each room were reduced, we should feel disposed to try the sufficiency of the present ventilation with the remainder before making any change in it; with the present number of men the ventilation is insufficient.

At the time of our inspection eight barrack-rooms were misappropriated for barrack stores, serjeants' quarters, &c., and nine rooms were temporarily misappropriated for other purposes.

The whole barrack is lit by candles.

There is no day-room for the men.

There is one school-room and one library.

There are two lavatories in the sunk basement of the building; they are reached by steep stairs descending from the courts; they are dark, damp, and unsuitable for the purpose. The bath accommodation is deficient, as there are only two iron baths for the whole barrack.

There is no laundry belonging to the establishment.

There are four cook-houses, two on each side, with eight boilers in each, but there are no means of roasting or baking meat.

There are no cleaning-rooms, or covered sheds for drill.

The water supply is derived from the Water Company's Works.

The surface drainage from the buildings is carried by trapped drains into the main sewers, which empty themselves into the river.

There is one large latrine of recent construction, situated on the slope below the level of the barrack. It is properly supplied with water and flushed, but the contents do not pass into the sewers on account, as we are informed, of local objections to polluting the river. The drainage is, therefore, led into a cesspool, situated considerably below, but at no great distance from, the barracks, and as there is no outlet, the contents sometimes overflow the surface of the ground and occasion nuisance ; this cesspool requires, it is stated, 10 days and nights for emptying ; it is a serious nuisance and ought to be abated. If there are insurmountable difficulties to obtaining an outlet for the whole drainage of the latrines, the cesspool ought to be removed to a greater distance, its fluid contents deodorized and drained away into the sewers, and the solid residue carted away for manure.

Non-commissioned officers have no separate sleeping apartments in this barrack.

The old hospital, situated below the barrack, in a very damp, unhealthy position, is now appropriated for 42 married soldiers. It is a one-story building, consisting of large rooms, which several families occupy in common, and is not suitable for the purpose.

We have adverted to the crowded condition of these barrack-rooms, and stated that 17 rooms are misappropriated for various purposes. If these rooms were restored to the barrack, they would accommodate probably 160 or 170 men, and would reduce the deficiency of accommodation to that extent. Of course it would be necessary to provide otherwise for the present occupants of these rooms.

*The following are the Improvements we would recommend in regard to these Barracks :—*

1. Reduction of overcrowding and allotting 600 cubic feet of space per man, according to our instructions. There are some dark rooms which would be better used for other purposes than barrack-rooms.
2. Lighting the barrack with gas.
3. Removing the kitchens from the interior of the courts to a more suitable locality, and providing them with means of roasting and baking meat.
4. Removal of the lavatories from the basement. Suitable lavatories, with bath-rooms properly supplied with baths, and having a covered communication with the passages, might be easily constructed in the courts.
5. Drainage of latrines to be improved in the manner suggested.
6. One or more day-rooms to be provided, also a covered shed for drill.
7. Married quarters to be improved, or reconstructed on better principles, as at Anglesey barracks, Portsmouth, or the Guards' model lodging house, Westminster.

### *Winchester Barrack Hospital.*

This is a new hospital adjoining the barracks, but not in so good a position. The ventilation outside is liable to interruption by adjoining walls ; the hospital is close to the higher end of the town, and is not quite so well placed as the barracks.

The building is three stories high, and consists of wards and corridors. The corridors cover the northern face of the building, and derive their light and air through ordinary windows. The three flats of corridors communicate by a staircase extending from top to bottom of the building, and the wards enter from the corridors by doors, over which are swing windows for ventilation. The wards have windows to the open air only on one side, except the end wards of each flat, which have windows at opposite ends ; the distance between the opposite windows in the larger wards is 37 feet, a distance much too great for natural ventilation to be efficiently carried out ; the shorter wards are ventilated partly into the corridors, and partly into the open air, as already mentioned. Half of the wards are 12 feet high, and half are 12 feet 6 inches high.

The whole structure of this hospital renders natural ventilation difficult, although means have been introduced to facilitate it in every ward.

Thus every window in the building has a perforated glass pane in the upper tier of glass. The four larger wards have four gratings each near the floor, for admitting fresh air, and the eight smaller wards have each two similar gratings. Each ward on the second floor has a perforated plate in the ceiling, and, as already mentioned, there are swing fanlights and windows between the wards and corridors.

Notwithstanding these arrangements, the hospital ventilation was defective at the time of our visit.

There are in all 13 wards.

The itch ward on the ground floor has seven beds. The two larger wards on each of the first and second floors have 13 beds in each, and the four smaller wards in each floor have 10 beds in each.

The lowest amount of cubic space per bed is 442 cubic feet in the itch ward. In the other wards the cubic space per bed is 734, 764, 792, and 825 cubic feet per bed.

The wards are lighted with gas, and warmed by the Anglo-American fireplace.

There is a lavatory and bath-room, with hot and cold water laid on.

The kitchen appears to be sufficient for the hospital cooking.

The water supply is stated to be abundant and good.

Each floor is supplied with self-acting water-closets, and there is a water latrine properly constructed in the court behind. The drainage is conveyed into a cesspool outside the hospital precincts ; but as this arrangement is inadmissible, we should advise, if possible, the hospital drainage to be connected with the barrack drainage, when it is improved as already recommended, and the whole soil to be deodorized and removed at the same point.

The hospital is too small for the barracks, even on its present scale of accommodation.

It contains in all 132 beds ; but as the orderlies, contrary to all sound rule, sleep in the wards, 12 beds are occupied by them, and must be deducted, so that there are only 120 beds for sick.

But, as the following table will show, this number of beds is much more than the building ought to contain, in conformity with our instructions to allot 1,200 cubic feet per bed.

| —— | Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Space. |
|---|---|---|---|---|
| 1st Floor | 2 | 26 | 16 | 10 |
| | 4 | 40 | 28 | 12 |
| 2nd Floor | 2 | 26 | 18 | 8 |
| | 4 | 40 | 28 | 12 |
| Ground Floor | Itch Ward. | 7 | 4 | |
| Total | 13 | 139 | 94 | 45 |

In order to diminish the overcrowding, the following reduction in numbers is necessary :

The itch ward at the very outside should contain no more than four beds, instead of seven, and this would give considerably less than the cubic space mentioned.

The four smaller wards on the first floor to have at the outside seven beds in each, 28 in all, instead of 40

as at present. This would give about 1,130 cubic feet per bed.

The two larger wards on the first floor to have eight beds in each, or 16 beds instead of 26, which would give a fraction less than 1,200 cubic feet each. The four smaller wards on the second floor to have seven beds in each, that is, 28 beds instead of 40, giving a cubic space of less than 1,200 feet. The two larger wards on the second floor to have nine beds in each, that is, 18 beds in the two, instead of 26, as at present ; this would give about 1,100 cubic feet per bed.

The total accommodation for sick, when the orderlies are removed from the wards, as they ought to be forthwith, will, therefore, amount to 94 beds, which is an extent of accommodation much too small for the strength in barracks.

*We recommend the following Sanitary Improvements to be carried out:—*

1. Reduction of numbers of beds in the manner mentioned.
2. Ventilating every ward and corridor by shafts carried from the ceiling above the roof of the building, closing up all the air bricks near the floors of the wards, and admitting sufficient air by suitable inlets near the ceilings to supply the ventilation.
3. Improving the drainage as already mentioned.

These changes will remove, as far as practicable, the more obvious defects of the building ; but there are others which also require removal.

The hospital accommodation requires extension.

There are no small wards for isolated cases of sickness.

There is no waiting-room for sick men, who on arrival at hospital are obliged to stand about the cold passages and stairs.

There is a covered ambulatory for convalescents exercising in wet weather ; but it cannot be used because there is no covered communication between it and the hospital ; its chief use is, therefore, limited to drying clothes in wet weather.

There is no accommodation for the sick of soldiers' families.

There are no orderlies' rooms.

It appears to us that these deficiencies ought to be supplied, and that steps should be taken to extend the hospital on a better plan than the present, to make the accommodation more commensurate with the requirements of the barracks.

(Signed) Sidney Herbert.
John Sutherland.
W. H. Burrell.
Douglas Galton.

July 9, 1858.
To the Secretary of State for War.

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## HILSEA BARRACK, PORTSMOUTH.

This is a barrack for Royal Artillery. It is situated on the east side of Portsmouth Harbour, at its northern extremity, on low, badly drained ground, at a short distance from a muddy tidal creek.

The district is exposed to malaria, and intermittent fever occurs among troops in occupation.

The barracks are of brick, and consist of a single line of buildings two stories high, the stables occupying the lower story. The men's rooms are over the stables, and are reached by an outside staircase at one end leading to a long wooden balcony, on which the room doors open. A block of recently constructed buildings at right angles to the main line contains the cook-house and school-room. In front are a number of cottage-looking structures, which were being adapted, at the time of our inspection, for ablution and bath rooms, &c. Another two-story range of old buildings close to these contain the stores, over which, in attics resembling ordinary lofts, is the present hospital accommodation. There is a good parade and exercising ground behind the men's rooms. The officers' quarters are in an old detached residence outside the barrack enclosure.

There are five men's rooms, with regulation accommodation for 25 men each, at 474 cubic feet per man. Each room is 40 feet long by 28 feet broad, and 10 feet 7 inches high.

The rooms have each five windows, three at one end, and two windows and the door at the opposite end. The distance between the opposite windows is 40 feet, and the beds are ranged along the dead walls.

The following table shows the total accommodation in contrast with what it would be at 600 cubic feet per man :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 6 | 150 | 120 | 30 |

By giving a fraction under 600 cubic feet per man, each room will hold 20 men instead of 25, and the total accommodation in the barrack will be sufficient for 120 men instead of 150, as at present.

There are two openings in the ceiling of each room for ventilation. They are covered by moveable boards, but are not sufficient, as the rooms were close, and defectively ventilated. Two inlets are required, one at each end of the room, and a remodelled grate for warming part of the air in winter. Were these improvements carried out, and the numbers of men reduced to 20 per room, the rooms would be sufficiently ventilated.

The stables below also require ventilation by shafts carried one from each corner above the roof.

The rooms are lighted with candles. When the projected extension of these barracks is carried out gas should be laid on to them.

At the time of our inspection proper lavatory and bath accommodation was being fitted up.

The women's wash-house was also undergoing an entire remodelling, to make it more suitable for the requirements of the barracks.

A new cook-house, suitably provided with boilers and ovens, was being completed.

Next to it and under the same roof, a new school-house was also being completed.

These various improvements had been very much required, and will add materially to the health and comfort of the soldier.

There are three workshops, for collar maker, wheeler, and blacksmith. All require ventilation through the roof.

There are two sources of water supply, one from wells within the boundary, the other from the company's mains. When the barrack is extended a larger supply pipe will be required, and the water should be laid on at pressure.

The barrack drainage is in a very imperfect condition. The privies are wholly undrained, and are connected with the manure pits, the whole being emptied from time to time by contract. Even the surface drainage, and that from the ablution-room, wash-house, &c., although conveyed under ground by earthenware pipes, is discharged into cesspits, the overflow from which escapes into ditches in the vicinity of the barrack. One of these open ditches forms the boundary of a narrow field outside the barrack wall on which it is proposed to extend the accommodation. This ditch ought to be drained and filled up.

The obvious course to take in this case is to drain the whole barrack to an outlet which can be obtained at no great distance ; to convert all the privies into water latrines, and to fill up the cesspits.

There are two living rooms for non-commissioned officers, but no mess-room.

Ventilation for the guard-room is required by a shaft and remodelled grate.

The cells require warming by a stove in the passage.

Taken as a whole, this barrack cannot be considered a good one. Its position is not such as would be selected simply from considerations of health; but there are extensive defensive works being carried out in the immediate vicinity for which barrack accommodation will be required. It is hence proposed to extend Hilsea Barracks over the low, flat ground in the vicinity. To enable this to be done with the least risk to health, we would advise the neighbouring ground to be deep drained, so as to obtain a thoroughly dry position for the buildings and their immediate vicinity. All open ditches should be drained by pipes and filled up.

The men's rooms in the new buildings should be well raised above the ground, with a free ventilation beneath the floors. The stables should be separated from the barrack-rooms, and not under them. There should be no cesspits or other accumulations of filth; the surface drainage and guttering should be carefully attended to; all drains should be trapped and ventilated; in short, every precaution should be taken to diminish, by sanitary works, the natural disadvantages of site.

In so far as regards the present buildings, *the improvements required may be summed up as follows:—*

1. Reduction of the numbers of men in each room from 25 to 20.

2. Ventilation of the men's rooms to be improved by carrying shafts from the ceiling openings above the roof. Each room to have two inlets for air, one at each end and close to the ceiling. Each room to have a remodelled grate. Each non-commissioned officer's room to have an Arnott's ventilator. The guard-room to have a shaft through the roof and a remodelled grate. Cells to be warmed by a stove in the passage. Workshops to be ventilated.

3. Stables to be ventilated by shafts carried from the corners of the ceilings to above the roof.

4. Gas to be laid on to the barrack-rooms.

5. Barrack to be drained to an outlet. Cesspits to be abolished. Privies to be reconstructed as water latrines, with divisions of seats, half-doors, light and ventilation. Ditches in the vicinity of the barrack to be drained and filled up. Adjacent ground to be drained.

### *Hilsea Barrack Hospital.*

This hospital is a loft over stores, having nine beds. It is only a temporary place of reception, until the serious cases of sickness can be sent to Portsmouth General Hospital. It is, nevertheless, quite unsuited for its object, and ought to be abandoned as soon as possible. The large addition to be made to the force at Hilsea indicates that increased hospital accommodation is required. A healthy piece of ground should be selected, and a proper hospital built.

In regard to the present building, *we would advise solely—*

That ventilation through the ridge be provided.

JOHN SUTHERAND.
W. H. BURRELL.
DOUGLAS GALTON.

April 1860.

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## CHRISTCHURCH BARRACKS.

SIR,

IN conformity with our instructions, we have examined into the sanitary condition of the Artillery Barracks, Christchurch, and we have the honour to report on them as follows:—

These barracks are situated in a healthy open country, at about a mile from the town of Christchurch, and are entirely isolated from dwellings of the civil population. They are situated within a spacious enclosure, and are arranged in the following manner:—Near the end of the enclosure facing the entrance gate is a long range of buildings, containing soldiers' rooms over stables, with officers' quarters at one end. Other officers' quarters are contained in a building at right angles to the centre line. Behind the centre range, and sufficiently removed from it, are placed the latrines, wash-houses, canteen, &c.

There are two ranges of stables, besides those in the centre building. These ranges are carried along the parade ground, one range on each side; they run at right angles to the centre range, and bound the parade ground on opposite sides. At the end of one of these stable ranges, nearest the entrance gate, is the hospital.

The men's rooms over the stables consist of one flat, with an attic above. They are reached by a central staircase, on one side of which, on the ground floor, is placed the kitchen, and on the other side an ablution-room.

From the top of the staircase an inner passage branches off right and left, having a single window at one end of it, and abutting against the wall of the officers' quarters at the other end,—so that it has no thorough draft for ventilation. From this dark end a staircase is carried up to the attic above.

The barrack-rooms on the first floor open right and left out of the central passage. These rooms are of the construction usual to cavalry barracks. The door, with a sliding window over it, is close to the fire. Opposite the door is a single sliding window, giving light to the room, and the far end of the room is a *cul-de-sac*, deficient alike in light and in means of renewing the air. In some of the rooms there are blank windows.

There are two attics of the usual form and construction, but better on the whole than any attic barrack-rooms we have seen.

There are altogether nine men's rooms and these two attics, but three of the men's rooms are used for married quarters. The total accommodation is for 145 men and two staff serjeants, but the occupation at the time the return was made to us was below the regulation number. Had the whole regulation number of men been in barracks, and had the three rooms misappropriated for married quarters been occupied at the same time by married people, this misappropriation would have led to great overcrowding.

The following table shows the regulation accommodation in the rooms, exclusive of those occupied by married people, together with the number of men these rooms would contain at 600 cubic feet per man:—

| Rooms. | Present Regulation Number of Men. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 2, 3 | 20 | 14 | 6 |
| 6, 7, 8, 9 | 44 | 28 | 16 |
| Attics:— | | | |
| No. 1 | 36 | 26 | 10 |
| 2 | 26 | 20 | 6 |
| Totals - | 126 | 88 | 38 |

Rooms Nos. 1, 4, and 5 have regulation space for 17 men, and would afford about 600 cubic feet per man to 13 men. As already stated, they are at present used as married quarters, but if they were restored to the men they would raise the accommodation in this barrack at 600 cubic feet per man to 88 + 13 = 101 men, which is the maximum number the barrack ought to contain. The regulation space, as stated above, is for 145 men, while the total accom-

modation is sufficient for 101 men only, including the married rooms, but exclusive of these rooms there is space for 88 men, and no more.

The rooms are all of one height, namely, 9 feet 6 inches. They have a common breadth of 17 feet, and are from 14 feet 6 to 27 feet 8 inches long. The two attics are respectively 86 feet and 65 feet 6 inches long, 26 feet 6 inches broad, and 7 feet high. The rooms, as already stated, have one window each, and the attics have one 11, and the other 7, windows. The beds are very close to each other, being only 8 or 9 inches from side to side in the rooms and 18 inches in the attics.

Ventilation is to a certain extent provided for in these rooms by openings in the ceiling into a space below the slates, and the rooms are warmed by the old pattern fire-grate. Each attic has a stove in addition to a fire-grate.

The barrack-rooms are much overcrowded in appearance, and neither the ventilating nor warming arrangements are sufficient. The passage and men's rooms are too dark, and the room doors are not properly placed for either comfort or ventilation.

To remedy these defects we propose to place a large ventilating skylight at the top of the stair leading from the inner passage to the attics. We would propose to open the blank windows in the men's rooms on the first floor, and to move the doors from the space next the fire to the opposite end of the room. We would further carry a ventilating shaft of the usual construction from the opening in the room ceiling up through the roof. One inlet for fresh air should also be introduced in the outer wall close to the ceiling, and the fire-grates should be remodelled to warm part of the air admitted.

Some ventilation is provided for the attics by openings round the stove pipes. The area is hardly sufficient. It should be enlarged to afford the requisite section for the number of men in the rooms, and each attic-room should have two inlets for air on each side close to the ceiling. The attic fire-grates should also be remodelled.

A few perforated glass panes should be placed in the end window of the corridor on the first floor.

By these improvements the whole mass of air within the barrack will be kept moving, instead of remaining comparatively stagnant, as is the case at present.

As in other instances where stables are placed under men's rooms, it will be necessary to carry ventilating shafts from the corners above the roof, to provide as far as possible that the stable effluvia shall not pass into the rooms.

The shed stables have their ventilation at the ridge by means of louvres. There are also openings in the wall for admitting air.

There is no regular school-room belonging to this barrack. Any room that can be best spared is allotted for the purpose.

There is no day-room and no library.

The ablution-room, as already stated, is in the centre building, under the men's rooms. It is supplied with water by a pump and tank, and has a slate ablution-table with the ordinary iron hand basins. It requires pegs and gratings.

Two baths have been recently provided in a small building close to the boundary wall behind the centre range. The accommodation is sufficient for the size of the barrack.

The women's wash-house is a shed building of the usual construction. It has no fixed tubs, and no means of drying linen.

The cook-house has eight boilers of the ordinary construction, and a brick oven. It is only eight feet six inches in width, and the range of boilers occupies half of the space.

Water is derived from three wells within the barrack enclosure. It is stated not to be sufficient at times.

The privy accommodation consists of large open sheds, with cesspits and urinals in front. They have no drainage. They should be reconstructed as water latrines and drained to an outlet, or the contents of the latrine should be flushed into a water-tight cart and removed daily, on the Glasgow plan. There is a sewer into which the officer's water-closets are drained, and possibly the same outlet might be adopted for the latrine drainage. All the privies within the enclosure should be improved on the same plan.

There is a very large manure-pit and also an ash-pit behind the barrack range. Both are dug below the surface, and are much too large. We would recommend their being filled up above the level, paved, and drained.

Proper ventilation is required for the canteen rooms. Arnott's valves and perforated panes in the upper window sashes will be sufficient.

The guard-room also requires ventilation by a shaft and remodelled grate.

*The following are the Sanitary Improvements required for this Barrack:—*

1. Reduction of the number of men in each room to afford 600 cubic feet per man.

2. Ventilation and lighting the corridor by a shaft, and ventilating skylight over the top of the stair leading to the attic, and by perforated glass panes in the end windows. Ventilation of the men's rooms by shafts carried from the ceilings above the roof, and by inlets for air. Barrack-room fire-grates to be remodelled to warm part of the air admitted to the rooms.

Canteen tap and non-commissioned officers' rooms to have Arnott's ventilators and perforated panes.

Guard-room to be ventilated by a shaft through the roof and a remodelled grate. Barrack-room doors to be moved to the end of the room furthest from the fire. Additional windows to be opened into the men's rooms.

3. Ventilation of the stables under the men's rooms by shafts carried from the corners to above the roof.

4. Ablution-room to have pegs and gratings.

5. Women's wash-house to have fixed tubs and means of drying linen.

6. All privies to be reconstructed as water latrines, with divisions of seats, half-doors, light and ventilation, and to be drained to an outlet, or their contents flushed daily into a cart and removed. Urinals to be reconstructed and supplied with means of washing and cleansing. All untrapped drains to be trapped, and cesspits to be abolished.

7. Manure and ash pits to be raised above the level of the ground, contracted in size, paved, and drained.

8. It would be very desirable in this, as in similar cases, to remove the cook-house into a separate building, and either to remove the ablution-room or to supply it with fixed basins, to prevent the large wet surface at present exposed within the barrack range.

Lastly some provision of married quarters should be made to prevent the present misappropriation of men's rooms for the purpose.

### *Christchurch Artillery Hospital.*

This hospital is a long, narrow, one-story building, erected against the barrack enclosure wall, at the end of one of the stable ranges. It consists of three wards, a serjeant's room, a surgery, and kitchen, built in line with the windows facing the parade ground. Access is obtained by a passage which runs from the front of the hospital, and terminates behind, in a long inner corridor, one side of which is formed by the barrack boundary wall, and the other side by the wards, &c. The wards are 11 feet 3 inches high, and about 12 feet wide. Their length varies from 9 feet 9 inches to 24 feet 6, and 37 feet 4 inches.

The corridor has a window at the end and skylights above. The wards and office doors open out of it, and most of the ward ventilation is into this corridor, by openings over the doors, so that it is the receptacle of the foul air of the building.

There is no place for convalescents exercising,

except the parade ground in front, or a very small yard, at one end of the hospital, containing the dead-house, the drainage from which is carried along the front of the hospital to an adjacent manure pit. As the hospital latrine is not drained, there is also a cess-pit in this small yard. The yard is not drained, and the surface water escapes by a hole in the boundary wall into a field behind.

The general plan and arrangement of the building are very defective, and it is not well adapted for sick.

The three wards are intended to accommodate 14 beds, with from 649 to 730 cubic feet per bed.

The following table gives the details :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 5 | 3 | 2 |
| 2 | 7 | 5 | 2 |
| 3 | 2 | 1 | 1 |
| Total - | 14 | 9 | 5 |

The wards are considerably over-crowded, and ought to contain no more than nine beds, and this would give little more than 1,000 cubic feet per bed.

There are no sufficient means of ventilation for the wards. To supply this deficiency we would propose to provide each ward with a shaft and inlet of the usual construction. In one of the wards there are two fire-places, one of which might be dispensed with, and built up. If this were done the disused chimney might be readily converted into a ventilating shaft by making an opening into it double its sectional area, close to the ceiling.

The wards are warmed by the ordinary barrack fire-grate, instead of which we would recommend our remodelled grates to be introduced.

The kitchen, which is under the same roof, and in the same line of buildings as the wards, requires ventilation through the roof. It is not sufficiently supplied with means of cooking, and requires an oven.

The surgery is very small and inconvenient, but this defect does not admit of remedy. It has no fire-place at which medicines could be prepared.

There is no pack store.

It has been stated to us that there is some probability of this barrack being given up, and we shall therefore confine our recommendations for the hospital solely to matters of absolute necessity.

*We would recommend :—*

1. That the wards be ventilated by shafts, inlets, and remodelled grates.

2. That the ventilation of the corridor be improved by louvres through the roof.

3. That the cesspit in the yard be abolished, the privy converted into water-closets, and drained. That the surface drainage of the yard be improved and connected with the barrack drainage.

4. That an oven be provided for the kitchen.

5. A small ablution and bath room to be provided.

Should it be eventually decided to retain this barrack, it would be necessary to extend the hospital, by adding a floor to it, or otherwise to supply the present deficiency in ward space and other accommodation.

JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

May 1860.

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## ISLE OF WIGHT.

SIR,

IN conformity with our instructions, we have inspected the Barracks and Hospitals at Parkhurst and Sandown, Isle of Wight, and have the honour to report on them as follows :—

### 1. PARKHURST BARRACK.

This barrack was constructed in 1796–97, and partakes more of the nature of a permanent camp than of a barrack, properly so called. It is situated in the open country, on the slope of a hill, within an enclosure 18A. 21P. in extent, about a mile from the river Medina, and together with the hospital ground and exercising ground it occupies a very considerable surface area.

The position is airy and healthy, with sufficient natural means of drainage if they be properly taken advantage of ; but the local climate is relaxing, and is said to be unfavourable to speedy convalescence. Although the subsoil is clay, the rapid fall of much of the ground keeps the surface dry. There is a large area, however, on the lower levels, as, for example, the 29-acre field in front of the hospital, which becomes swampy after rain, and hardly available for its object as an exercising ground during six months of the year on account of the want of subsoil drainage. A wide roadway extends from the entrance gate of the barrack directly up to the top of the slope. On the left-hand side of the roadway are situated the officers' quarters, accommodation for non-commissioned officers and for men, the mess establishment, main guard, cells, &c. On the right hand of the roadway are other lines of men's quarters, the cook-houses, ablution and bath rooms, water tanks, the old hospital, now used as married quarters, the privies, &c. Behind the buildings on the left hand of the roadway is a large sloping parade ground, enclosed by the barracks along one side, and having on the opposite side the provost establishment, stores, and a riding house, which has been converted partly into an excellent chapel school. At a short distance beyond these buildings, and still to the left, is the hospital.

The barrack-rooms consist of long wooden huts on brick foundations, erected across the slope, an unadvisable arrangement, on account of its interfering with the natural fall of the drainage, unless the water be caught and turned aside above each line. The outside walls of each hut are covered with thin tiles resembling sections of brick, imbedded in mortar, so that at first sight all the structures have the appearance of being built of brick. The inside walls are whitewashed. The rooms are a good height, and are carried up into the roofs, which are lined inside, and plastered. There is a porch outside the door of each room. A recess of it is lighted and ventilated by a window, and in this recess are placed the urine tubs, brooms, &c., during the day. Taken as a whole, these barrack-rooms have a light airy appearance and are more cheerful than most rooms of permanent barracks.

The total accommodation consists of 31 serjeants rooms and 89 barrack-rooms. Each serjeant's room accommodates one man. The men's rooms are of different sizes. They vary from 22 feet to 40 feet in length. They are from 20 feet to 27 feet wide. The lowest class of rooms have a height of 11 feet 6 inches, from which the height increases to 12, 14, and 16 feet. These heights include the part carried up into the roof. Half of the rooms have four windows each, and the remainder have three, five, and six windows, according to their size. Their cubic capacity varies from 5,566 feet up to 14,000 feet, and they accommodate from 12 to 24 men in each, with from 426 to 583 cubic feet per man. There is, however, only one room in which the men would be in possession of the larger of the latter amounts of space, but this room, although on the construction as a barrack-room, is occupied as a can-

teen. In 81 rooms the space per man varies from 426 to 489 cubic feet. The rooms are intended to accommodate 1,448 men. There were at the time the return was made up 16 twelve-men rooms and seven 16-men rooms occupied as married quarters. The following table gives the details of the accommodation :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Number of Men per Room at 600 Cubic Feet per Man. |
|---|---|---|---|---|---|
| 16 | 320 | 256 | 64 | 20 | 16 |
| 31 | 558 | 403 | 155 | 18 | 13 |
| 9 | 126 | 99 | 27 | 14 | 11 |
| 24 | 288 | 216 | 72 | 12 | 9 |
| 7 | 112 | 105 | 7 | 16 | 15 |
| 1 | 24 | 23 | 1 | 24 | 23 Canteen. |
| 1 | 20 | 16 | 4 | 20 | 16 |
| Total 89 | 1,448 | 1,118 | 330 | — | — |

This table shows that if all the rooms, including the canteen and married quarters, were occupied at 600 cubic per man, there would be space for 1,118 men. Deducting the rooms occupied as married quarters and canteen, there would be space for 846 men at 600 cubic feet per man.

Each barrack-room is ventilated by two shafts through the roof, and by a large open wasteful fireplace. The method is a very defective one, and causes incessant drafts in windy weather. The result is that the candles are blown about and wasted, and the men close up the ventilators. One shaft of sufficient sectional area would be enough for each room, and there should be, in addition, two inlets for fresh air, one on each of the opposite sides of the room, at the top of the window.

The fire-grate is placed in the division wall between the rooms. We would propose to substitute for it a remodelled fire-grate, to warm part of the air admitted in winter.

The barrack-rooms are lighted at night with candles. Gas is in use at Parkhurst Prison, which is only a short distance from the barrack, and we are informed that it would be easy to supply the whole barrack with gas from that source.

Two ablution-rooms have been provided for the whole barrack. They are at too great a distance from most of the rooms. They have slate tables, without beads, and there are basins, pegs, and gratings, and water is laid on from tanks.

A good bath-room, with seven slate baths, divisions, and gratings, was being constructed at the time we were there.

There is no laundry. The women's wash-houses are deficient in accommodation. There are two of them, having boilers, but no other convenience. They should have fixed tubs, with water laid on, gratings, ironing tables, and means of drying linen. They also require roof ventilation. The floors should be better flagged and drained.

There are four good cook-houses, with 13 boilers each, arranged round a central chimney. The boilers are of the old square pattern. There are louvres in the roof for ventilation. An oven for baking meat has been recently provided in each cook-house.

A great defect in this barrack is the condition of the drainage. The surface round the huts is in some places very roughly paved. The gutters are not well formed, and would be injurious rather than beneficial, were it not for the steepness of the slope down which they are carried. In some places urine and foul water were passing away on the surface. There are superficial drains, with large untrapped gulley grates opening into them. Two of these pass under buildings. There are altogether 70 sewers and drains connected with the barrack, about 30 of which only are trapped. They all discharge into two main drains at the lower end of the barracks.

There is no drainage for the privies. These conveniences are placed close to the boundary wall. They are of the usual ladder form, connected with cesspits outside the boundary, and very offensive. When the cesspits are emptied the unwholesome effluvia from them pervades the whole establishment. Before any steps can be taken to remove this nuisance, the entire drainage must be revised ; an outlet, if possible, obtained for the sewage ; obsolete drains filled up ; new lines laid down, and a thorough system of subsoil drainage carried out to drain the wet land. All gully grates must be renewed where necessary, and trapped. The main lines of drainage should be ventilated at the higher end of the slope, and at a sufficient distance from the barrack huts. A box of powdered charcoal placed at the mouth of the ventilator will do all that is required in the way of disinfecting the sewer air.

The privies should then be reconstructed as water latrines, on Macfarlane's principle ; they should have divisions of seats, half-doors, light and ventilation ; and all cesspits should be cleansed, filled up, and abolished.

A marked instance of the defective state of the drainage is afforded by the officers' quarters. These quarters are built in a small square. In the centre of the square are the privies, over cesspits, 12 feet deep, from which the ground is saturated with filth, and much nuisance occasioned. Sickness is stated to have arisen in the officers' quarters by this condition of the drainage. There is also an offensive ashpit in the same square. The whole should be removed ; the square opened up ; the cesspits abolished, and drained water-closets provided for the officers' quarters.

If a proper outlet for the privy drainage cannot be obtained, it should be disposed of as manure, in the same way as is done with Parkhurst Prison drainage, only greater care ought to be taken in applying it. The prison sewage is pumped up to a tank at the top of an elevation too close to the barracks, and allowed to flow over the surface, and in the immediate vicinity of the irrigation is a building which we were told is the parish fever hospital ; the whole procedure affording an excellent example of how a principle admirable in itself may be misused in its application.

If a suitable outlet cannot be obtained for the latrine sewage, we would recommend its being discharged once or twice a day into a water-tight cart, and removed for manure, as is done at Glasgow barracks.

Water is derived from three deep wells, and from two rain-water tanks. The supply is stated to be deficient in summer ; but new pumps are being constructed. The rain-water tanks, each of which contains 11,000 gallons, are supplied from the eaves spouts. Each deep well pump has a cast-iron tank to contain 347 gallons. There are besides two fire-engine tanks, each capable of containing 5,700 gallons of water, derived from the surface drains. The labour of 30 men is employed to raise the required amount of water from the pumps. The method of water supply is uncertain and complicated, while from the nature of the ground, the whole establishment, both barrack and hospital, could be supplied from one tank on the higher level of the ground. It is worthy of consideration whether a small steam engine might not be used for raising water to the height required for this purpose. We have frequently pointed out the great advantages accruing from a constant water supply for all sanitary purposes, such as drainage, latrines, baths, wash-houses, &c., over an irregular and intermittent supply obtained by hand labour, and the present case is one in which the change might be adopted with great advantage.

The urinals are partly of slate, partly of stone ; the latter are very imperfect in construction and drainage, and not supplied with water. Improved urinals are required.

The ashpits are also, of defective construction; they are large and deep, and expose too much surface. They ought to be contracted in size. The floors ought to be raised above the level of the ground, flagged, and drained to carry off the rain water.

As already mentioned, the non-commissioned officers are accommodated in 31 small rooms, made by dividing huts of the same construction as those used for men; they are unventilated, and require Arnott's valves in the chimneys, and remodelled grates, such as are used for non-commissioned officers' quarters.

There is a very good serjeants' mess, but it is also unventilated, and requires a shaft through the roof, with inlets under the eaves. The kitchen attached to this mess should have a better cooking range provided.

This is one of the very few barracks in which we have found a day-room in operation. The room is situated in a range of buildings near the library and chapel; it is well lighted; it is supplied with a billiard table, bagatelle table, and other games, periodicals, &c. It is managed by the men. There is a penny paid as entrance fee, and the subscription is 2*d.* per month. The admissions average about 2,000 per month. The strictest order and discipline are preserved by the management, and the results have been encouraging. The room is too small for the number of applicants for admission.

The room should be ventilated by a shaft, inlets, and a remodelled fire-grate, in the usual manner.

There is a library and reading-room adjoining this day-room, which should also be ventilated.

An excellent chapel, school, and lecture-room have been formed out of part of the old riding-school.

The unoccupied space of the riding school is used as a drill shed in wet weather.

In the same line of buildings is the provost establishment, consisting of 12 cells, in two stories, opening out of a corridor. The cells have each a capacity of 585 cubic feet, and are too small; otherwise they are good and admit of sufficient ventilation by sliding ventilators, which, however, are under the control of the prisoners. The latrines are connected with a cesspit, which ought to be abolished when the drainage of the barrack is improved. One unfavourable point in regard to these cells is, that being built on sloping ground, it is necessary to descend three steps to reach the corridor, so that the level of the ground outside is above the level of the floors of the cells.

There are five other cells used for temporary purposes, which are among the smallest we have anywhere met with. They are only 7 feet long, 6 feet 6 inches wide, and 7 feet high, affording only 315 cubic feet per prisoner. They are not fit to be used.

There are two guard-rooms, both in need of ventilation by a shaft through the roof and a remodelled grate.

The defaulters' room at one of these guard-rooms is very bad and not fit for its purpose; a new one should be provided.

The drainage of privies, &c., of these guard-rooms should be included in any general system of barrack drainage which may be adopted for the station.

*The following is a Summary of the Sanitary Improvements required for Albany Barrack:—*

1. Six hundred cubic feet to be allotted to each man in the barrack-rooms.

2. Barrack-rooms to have inlets for fresh air at the eaves, and remodelled fire-grates.

Non-commissioned officers' rooms to have Arnott's valves in the chimneys, and remodelled fire-grates. Serjeants' mess to be ventilated, and a better range provided for the mess kitchen.

Day-room to be ventilated by shafts, inlets, and a remodelled grate.

Reading-room and library to be similarly ventilated.

Guard-rooms to have shafts and remodelled grates.

3. Barrack to be lighted with gas.

4. Barrack drainage to be revised. The paving and surface gutters to be improved. Wet ground to be subsoil drained. Gulley grates to be trapped, and the sewers ventilated as suggested.

All privies to be reconstructed as water latrines, with divisions, half-doors, light, and ventilation, and their contents drained to an outlet, or removed in water-tight carts. Improved urinals to be constructed, and supplied with water.

Officers' privies and ashpits to be removed. The cesspits abolished, and water-closets, with drainage, to be provided.

5. Ashpits to be improved as suggested.

6. Women's wash-house to be improved and ventilated; also to be properly fitted up with fixed tubs, water, and a means of drying linen.

7. Beads to be provided for the ablution tables.

8. Water supply to be increased, and improved means of distribution provided.

While we make these recommendations for improving Parkhurst Barracks, it is incumbent on us at the same time to state, that from the temporary nature of the buildings, and from their mode of construction, they are very objectionable on two accounts. First, the very considerable extent of current repairs required, and, secondly, the nuisance from vermin in the woodwork. This last is a defect occurring in all wooden barracks after a time, and is much complained of in the present instance.

It is worthy of consideration whether the whole establishment might not be gradually renewed, and properly constructed brick huts substituted for the present wooden buildings. The decision of this question need not, however, interfere with carrying out the improvements we have advised for the present barracks.

*Hospital, Parkhurst.*

This hospital is situated on sloping ground at a short distance from the barrack, at the upper end of an undrained wet drill field, which after rain is sloppy and almost impassable. The building appears not to have been originally constructed for its present object. It consists of a central block, like an ordinary dwelling house, to which have been added two wings for the purpose of extending the accommodation.

The dwelling-house part has a passage from back to front of it, but the front lobby appears to be occasionally used to afford temporary accommodation of some sort, as it is cut off from the back part of the passage, which in reality forms the main entrance to the building. An ordinary wooden stair gives access to the different flats of the house. The original sitting-rooms and bed-rooms open out of it, a number of which are used for sick. Such an arrangement is under all circumstances an unsuitable one in a hospital, on account of difficulty in ventilating such wards; but in the present case, not only does this difficulty arise out of the original construction of the central part of the building, but the internal ventilation has been further deteriorated by building wings at each end, containing additional sick wards. The whole construction is very defective, and hardly fit for sick.

There are sunk basements under the building. One of these basements, situated under one of the wings, is fitted up and used as a sick ward, and, as might have been expected, cases at all serious do not recover in it, and have to be taken up stairs. This ward is totally unfit for occupation, and should be abandoned at once.

As a whole, the ward accommodation is of a defective character. There are altogether 15 wards, of which four are only 7 feet 6 inches high; they are in fact garrets. One ward is 8 feet 6 inches high, four wards are 8 feet 10 inches high, and six wards are 11 feet 4 inches high. It need hardly be stated that any of these heights are insufficient for sick wards. The six loftiest wards are intended for 16 beds each.

With regard to their other dimensions, the largest wards are 47 feet by 22; the smallest ward is about 15 feet square. The dimensions of the remaining wards, or rather bed-rooms, are those usually met with in country houses. The window space is very

deficient. No ward has above four windows. Three have two windows each, and there are seven wards with only one small window to each. The total accommodation is for 126 beds at from 404 to 794 cubic feet per bed. The following table shows the details:—

| Wards. | Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| No. 2 | 16 | 10 | 6 |
| „ 4 | 16 | 10 | 6 |
| „ 7 | 16 | 10 | 6 |
| „ 10 | 16 | 10 | 6 |
| „ 16 | 16 | 7 | 9 |
| „ 1 | 5 | 2 | 3 |
| „ 3 | 4 | 2 | 2 |
| „ 6 | 3 | 1 | 2 |
| „ 8 | 4 | 1 | 3 |
| „ 9 | 4 | 2 | 2 |
| „ 11 | 5 | 2 | 3 |
| „ 12 | 5 | 1 | 4 |
| „ 13 | 3 | 1 | 2 |
| „ 14 | 6 | 2 | 4 |
| „ 15 | 7 | 2 | 5 |
| Total - 15 | 126 | 63 | 63 |

The deficiency of accommodation in this hospital is 50 per cent. It is so large because there are a number of small rooms excessively overcrowded, while four of the rooms cannot safely be made to accommodate more than one bed each, although their cubic contents exceed 1,200 feet. The rooms are of such a size and construction as not to be suitable for more than one bed under any circumstances.

One of the wards for three sick persons is in an out range of buildings, formerly stables, and is a very unfit place for patients.

The ventilation of all the wards is very imperfect, and several of the worst wards are not ventilated. The plan which has been adopted in the others is that of openings close to the floor to admit air, and other openings close to the ceiling to allow air to escape. It will be necessary to close up all the lower openings. They admit cold air, which simply lowers the temperature of the ward round the beds, without beneficially affecting the state of the air. The upper openings should then be enlarged, to afford the requisite area per bed, and means to diffuse the air from them up towards the ceiling should be provided. The outlets should be of the usual form, namely, shafts carried from the corners of the wards above the roof.

Improved ventilating fire-grates for warming part of the air admitted during cold weather should also be introduced into the wards.

Besides ventilating the wards, it will be necessary to ventilate the stairs and passages by a louvred shaft carried from the top of the staircase, and by perforated frames in the windows.

The administrative parts of the hospital are not what they ought to be.

The hospital-serjeants' accommodation is in a damp unwholesome basement. The only accommodation for orderlies is one small unwholesome room, also in the basement, with a borrowed light, and only one bed. The ablution-room is in the same basement, and has no fixed basins. There are no baths, except the ordinary slipper bath. The wash-house is an outbuilding without fittings except boilers, and it has no ventilation. The hospital guard-room, which is in a range of buildings behind, is small and very bad. The stores are in the same buildings. These buildings were formerly stables. They are large enough, but otherwise not good. There is a dead-house at the end, without any suitable means of making *post mortem* examinations. It requires drainage, water, and a table.

The kitchen is in the centre basement of the hospital, and has no ventilation. It has a good and sufficient cooking range. The provision store belonging to the kitchen is very bad.

Water is derived from a well 375 feet deep, situated in the square behind the hospital. It is supplied to the buildings from tanks. Four water-closets, said to be continually out of repair, have been recently erected in a projection behind the staircase. They are not well placed, and obstruct the outer ventilation of that side of the hospital.

In the proper acceptation of the term, there is no drainage. All matter discharged from privies and water-closets is conducted into cesspits in the hospital yard, close to the well. One of these cesspits under the hospital windows is 35 feet deep. Another cesspit near the privies appeared to be full, as cesspool matter was oozing out of the ground and lying on the surface. A result of this state of the drainage is that offensive smells are complained of about the hospital.

On account of the general closeness and dampness of the air within the building the hospital is said to swarm with bugs.

Enough has been said to show that this building requires an entire revision. The air needs purifying both without and within it. *With this view we would recommend*:—

1. The large extent of wet sloppy ground about it to be underdrained.

2. The hospital itself to be sewered to an outlet, or if this be impossible to a sewage tank at a sufficient distance, from which the sewage can be run into carts and removed.

3. All cesspits to be cleaned out, filled up with fresh earth, and abolished.

4. All sick to be removed out of the basement, and the accommodation to be struck off the ward construction.

5. The number of beds per ward in the remaining wards to be reduced to the extent shown in the table, in order to give as near as may be 1,200 cubic feet per bed.

6. Ventilating shafts to be provided for all the wards. Present inlets near the floor to be permanently closed. Inlets at the ceiling to be enlarged, and improved so as to diffuse the air, or additional inlets in the outer walls close to the ceilings to be provided. Inlets to be provided for those wards in which there are none at present. Ventilating fire-grates to be introduced in the wards.

7. Stairs and passages to be ventilated by a shaft through the roof and perforated glass panes in the windows.

8. Kitchen to be ventilated, and to have a better provision store.

9. Better quarters to be provided for hospital serjeant and orderlies.

10. All the privies in the outbuildings to be reconstructed as water latrines, with drainage.

11. A bath-room (not in the basement) to be provided, with two baths, and hot and cold water laid on, and a proper ablution table with sunk basins.

12. Hospital guard-room to be improved, and ventilated by a shaft and remodelled grate.

13. Hospital to be thoroughly cleansed; the walls scraped and lime-washed. Useless partitions to be removed, especially in the basement, to enable the air to circulate.

14. A plan to be prepared for extending and improving the accommodation to meet the requirements of the station.

15. Dead-house to be improved as suggested.

Lastly, there being no accommodation for the sick wives or children of soldiers, the subject might be considered while reviewing the hospital plans, with the view of affording the required accommodation, either in the extended buildings, or in a special hospital hut near the married quarters in the barracks.

### 2. Sandown Barrack.

This barrack is situated in the open country above Sandown village, overlooking the bay. The situation is high, open, airy, and healthy, and has abundant natural facilities for drainage.

The barrack buildings consist of a centre block two stories high, and two side ranges, each one story high, projecting at right angles from the central block, but detached from it. One of these ranges is appropriated as officers' quarters. The other range contains quarters for men. It was originally an artillery barrack, the centre block having been set apart for men's quarters. The present officers' wing were the gun sheds, and the men's range opposite were stables. The establishment was next occupied by the coast guard, under whom it was arranged as at present. Like all other similar conversions of buildings, whatever may have been their original advantages, there is no doubt that in their present shape these ranges make bad quarters either for officers or men.

Behind the centre there is a one-story range of buildings, containing the cook-house, ablution-room, wash-house, and also the hospital accommodation, such as it is.

The centre range consists of separate houses, having each a passage and stair giving access to rooms for serjeants and for men. Some of the rooms are larger and better than others. Some have windows on opposite sides, while others have windows only on one side.

The rooms, 24 in number, are far from being uniform in size. They vary in length from less than 12 feet up to 34 feet. There are only two rooms with as great a breadth as 21 feet, the remaining rooms being of very various breadth; some as narrow as 8 feet. They vary in height from 9 to 10 and 11 feet. The average allowance of space per man is somewhat more than that usually given in small barracks. It varies from 310 to about 450. In two or three small rooms with two beds each the space is over 600 cubic feet.

The following table gives the accommodation in different classes of rooms:—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 10 | 6 | 4 |
| 1 | 8 | 5 | 3 |
| 1 | 18 | 13 | 5 |
| 1 | 18 | 12 | 6 |
| 1 | 12 | 7 | 5 |
| 1 | 18 | 12 | 6 |
| 5 Two-men rooms | 10 | 10 | — |
| 1 Three-men rooms | 3 | 2 | 1 |
| 14 Four-men rooms | 56 | 37 | 19 |
| 26 Total - | 153 | 104 | 49 |

The rooms have an excess of 49 beds over their approximate accommodation at 600 cubic feet each. The smaller rooms generally are hardly fit for barrack-rooms. As to comfort, they are only sufficient for single beds. An approximation to 600 cubic feet can be obtained by removing one bed out of each of them. But perhaps the best thing to do would be to revise the construction, and to rebuild this part of the barrack. The group of small rooms in the detached one-story building opposite the officers' quarters are very bad, and should be replaced by better accommodation.

None of the rooms are ventilated, and all require the usual improvements of shafts, inlets, and remodelled grates.

The serjeants' rooms require Arnott's ventilators.

There is neither day-room nor school-room. A small five-men room is set apart as a reading-room. These is no cleaning-room and no workshops.

There is a small, narrow ablution-room, without light except by the door. It has no gratings and no water supply. There is a slate bath, but as there is no water laid on the men seldom use it, on account of the labour required in carrying water to fill it. Before a man can bathe he has to pump and carry 20 buckets of water, which is an effectual bar to the use of this means of personal cleanliness.

These arrangements require to be revised. There is a cook-house, with four boilers, and a baking-oven recently constructed. The building requires a louvre in the roof for ventilation.

The water supply is derived from a well, but is so insufficient that 208 gallons of water per diem have to be purchased for the use of the troops when the barracks are occupied. There is a small rain-water tank.

The drainage is bad and insufficient. Such drains as there are are not trapped. The whole arrangement of surface draining and sewering requires to be revised, and a proper system laid down.

The privies are of the usual barrack form, connected with cesspits, and very offensive. They require to be drained, and reconstructed as water latrines on Macfarlane's principle, with the usual arrangement of seats, divisions, and half-doors, light and ventilation.

There is a large deep ashpit which receives surface drainage. It should be filled up; the surface raised above the level of the ground; paved and drained. The size should also be very much reduced.

The women's wash-house has no water and no conveniences.

There is a small guard-room and lock-up, both of which are very bad.

There are no married quarters, no non-commissioned officers' mess-room, and the storage is deficient. The buildings are said to require constant repairs. The barrack square has no proper enclosure.

Enough has been said to show how imperfect a barrack this is. The whole of it should be revised, if it is to be occupied; defective parts reconstructed, and deficiencies supplied.

*The Sanitary Improvements required are as follow:—*

1. To give 600 cubic feet per bed in the barrack-rooms.

2. To ventilate every room by shafts, inlets, and remodelled grates. The guard-room also to be ventilated.

3. Improved water supply to be provided and laid over the barracks.

4. Barrack to be drained to an outlet. Surface drainage and paving to be relaid. All drains to be trapped.

5. Ablution-room to be lighted, ventilated, and supplied with water. Gratings to be provided. Water to be laid on to the bath. Bath-room to be divided off from the ablution-room.

6. Cook-house to be ventilated.

7. Privies to be drained, supplied with water, and reconstructed as water latrines, with divisions and half-doors, and the building to be properly ventilated and lighted. Ashpit to be improved in the manner pointed out.

8. Women's wash-house to have the means of washing and drying linen.

### *Sandown Hospital.*

As already stated, the hospital is situated behind the centre block of the barrack, at the end of a one-story range of buildings containing the cook-house, &c.

It consists of two wards, one of which is 18 feet 9 inches long, 15 feet wide, and 10 feet high. The

other is 11 feet long, 10 feet 9 inches broad, and 10 feet high. The accommodation is as follows :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Space. |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 1 | 3 | 1 | 2 |
| 2 | 8 | 3 | 5 |

So far as space is concerned, these rooms would hold three beds instead of eight, but that is all that can be said about them. In other respects they are quite unfit for sick, except merely as affording space for a sick man until he can be removed. The rest of the establishment consists of a small orderly's room, and a small place for medicines. There is no water-closet, and sick men have to walk across a potato garden to a privy over a cesspit. There is no kitchen, bath, or ablution-room. The surface drainage is so defective that foul water was lying opposite the hospital door and windows when we were there. There is no ventilation, and no water supply except from the pump or from purchased water.

The medical officer who made the return to us regarding this place says, "strictly speaking, there "may be said to be no hospital at Sandown, and "when there are cases that require hospital comforts "I have always recommended that they be sent to "the General Hospital at Parkhurst." This, no doubt, is the wisest course, although, as we have already shown, Parkhurst hospital requires great improvement to make it fit for sick. In the proper sense of the term, there is no good hospital accommodation in the Isle of Wight at present.

The only thing that can be done with the Sandown wards is to ventilate them, and to improve their drainage and water supply, together with those of the barrack.

If the barrack is to be used by soldiers, there should certainly be proper hospital accommodation attached to it.

JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

*July*, 1860.

## CHICHESTER BARRACKS.

SIR,

WE have the honour to lay before you the following interim report on the sanitary condition of the cavalry and infantry barracks, Chichester.

These barracks are situated in the open country, about a mile to the north of Chichester, in an open, airy, healthy district. They are enclosed within an irregularly shaped area of ground, 22A. 2R. 15P. in extent. The subsoil on which they stand is shingle mixed with clay. It is only partially self-draining. In dry weather water is found at ten or twelve feet below the ground, but it sometimes rises to within two or three feet of the surface, and as a whole the ground is not sufficiently porous to absorb heavy rains quickly, and the water usually lies on the surface for some time after rain. This defect could be remedied by subsoil drainage.

The barracks consist of detached huts of wood resting on brick foundations.

Those of the cavalry are situated at the south end of the enclosure, and are built in a long row, divided into separate barrack-rooms by brick partitions containing the fireplaces. The cavalry stables are similarly constructed. The infantry huts are single and detached. All the huts are roofed with slates or tiles.

The infantry huts are 33 in number, and are all built on the same model. They are 30 feet long, 16 feet broad, and 10 feet high, and are intended to contain 14 men each, with 343 cubic feet per man. They have all plastered ceilings, and are lined inside with wood.

The rooms in the cavalry range are 25 feet square and 12 feet high, and contain 13 men each, with 574 cubic feet per man. One room for six men gives 725 cubic feet per man.

Each infantry hut has four windows, two on either opposite side. They are partly swing windows and partly sliding windows. Between two of the windows on one side is the entrance door, protected by a porch with a window in it; and opposite the door between two other windows is the fireplace, which is of brick, with a brick chimney. Between the fireplace and the door are the men's table and forms, which occupy nearly the whole of the space left by the beds. In these huts the superficial area is not turned to so good an account as it is in the more recent model huts, on account of the beds being arranged along the four walls. There are five beds at each end, and two beds at each side, and when they are let down nearly the whole surface of the floor is occupied, and the huts have the appearance of being very much crowded.

It would add to the men's comfort, as well as to the healthiness of the huts, to remove the four beds at the sides, leaving the end beds as they are. This would give 480 cubic feet per man for the remaining ten men. We have more than once stated that it is not necessary in barracks consisting of small detached wooden huts to give the same amount of cubic space which is required in large masonry barracks; and taking all the circumstances of the present case into consideration, we are of opinion these huts would not be overcrowded with ten men in each. We do not propose to make any alterations in the regulation numbers in the cavalry huts.

The following table will show the effect of these reductions on the total accommodation :—

| — | Rooms. | Present Regulation Accommodation. | Proposed Numbers. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|
| Infantry - | 33 | 462 | 330 | 132 |
| Cavalry - | 8 | 104 | 104 | — |
| „ - | 1 | 6 | 6 | — |
| Total - | 42 | 572 | 440 | 132 |

There is abundance of ground on which to erect huts for the displaced men, and for a large number of men besides, were it considered necessary to do so.

Some provision has been made for ventilating the huts by small apertures through the ceiling into the space between the ceiling and roof. We do not consider this as sufficient, and would advise that a ventilating shaft be carried from the centre of the ceiling through the ridge. We would propose to admit fresh air by a flue in the chimney, so arranged as that the air admitted should be partially warmed and thrown into the room near the ceiling by louvres arranged to send the current towards the ceiling.

There is a very good non-commissioned officers' mess-room. It is not sufficiently ventilated, and ought to have a silk flap ventilator into the chimney, and an inlet for air.

Candles are used for lighting the men's rooms. There is gas in Chichester, which is laid on to no great distance from the barracks. If the company's mains should be at any time laid down sufficiently near the barrack, we would advise gas being introduced throughout.

There is a brick building at one end of the enclosure, containing a good school-room, which has recently

been converted into a chapel school. It is sufficient, though not so expensively built as are the chapel schools belonging to permanent barracks. It requires louvres in the ridge for ventilation.

There is an infant school in a hut. It should be ventilated by a shaft and inlet, as recommended for the men's huts.

There is a library and librarian's quarters situated in a hut building. The library is very small, and should either be enlarged, or a day-room, to which the men could resort, should be provided. The librarian's quarter is good. A louvre should be placed in the roof of the library to afford the necessary ventilation.

Two huts are set apart as ablution-rooms for the men. They have water tanks and force pumps, and water is laid on to the ablution benches. The benches are of slate, but have no bead round the edge, as they ought to have. There are a few pegs over the basins, but there are no gratings for the feet, and the floors are not sufficiently sloped to secure rapid surface drainage. The rooms are hardly sufficiently lighted, and they have no ventilation. They should each have a ventilating skylight in the roof, and they should have more pegs and gratings. The tables should also have a bead put on them, sufficient to prevent the water dashing over on the men while washing.

Each ablution house has a common small slipper bath under the water tank. It is quite inadequate to the wants of the barrack, especially as regards its present occupation by a depôt battalion. Recruits are constantly arriving at the depôt in a condition requiring abundant means of cleanliness. For this purpose we would recommend that fixed baths with water laid on should be provided, in the proportion of one bath to every 100 men.

There is no proper laundry. The women's wash-house has fixed washing tubs, but water is not laid on, and there are no means of drying or getting up linen. These deficiences should be supplied, and the wash-house should be ventilated through the roof.

There are two cook-houses, one containing 15, the other 7 boilers, many of which are of the old pattern and require resetting.

There are no ovens, but we were informed that they were about to be provided. It would improve these cook-houses very much to give them additional light by a skylight through the roof.

The entire water supply of the barracks is derived from wells, and in such a soil it ought to be sufficient for all purposes, at least so far as the amount of it is concerned. But the quality of water derived from porous ground depends very much on the state of the drainage. If the surface drainage or cleansing be deficient, so that impurities are washed into the subsoil, all the wells are liable to become more or less tainted and unwholesome. The condition of the drainage becomes therefore in this, as in many similar instances, an important element in the question of water supply, quite apart from any malaria or atmospheric impurity that may proceed from defects in the drainage itself.

These barracks are most imperfectly drained. There is nothing but superficial surface drainage in all stages of imperfection. At the lower end of the enclosure among the cavalry barrack buildings, the whole sewage lies in gutters formed of rough cobble stones, with a deficient fall. Among the infantry huts the surface gutters are formed partly of carefully laid brick, and are of better construction. In other gutters the bottoms are rough, and foul water and mud lies in them close to the huts. There is a deep trench running along the front of the entire range of officers' quarters and huts in which foul water was lying stagnant to some depth. Into these gutters and trenches is turned the waste water from ablution houses, wash-houses, cook-houses, &c., no inconsiderable part of which must find its way into the subsoil; besides which none of the privies are drained, but are all placed over cesspits periodically emptied, and in the meantime their fluid contents escape into the ground.

Close to the cavalry barracks is a dungpit, in which foul water was lying at the time we were there, and at the opposite end of the barrack enclosure is a shallow gravel pit containing a quantity of green putrid water, which had no doubt percolated into it from the subsoil. The surface drainage, such as it is, escapes under the boundary wall by two outlets; one on the east, the other on the south side. The former outlet appears to end in a ditch; the drainage by the latter outlet passes into a ditch in a field immediately outside the barrack boundary, and thence into a pool of water close to the hedge beside the public highway. From thence it crosses the road into another pool, and appears to escape finally into the town sewers. The whole arrangement is as defective as it can well be, and requires a thorough reconstruction. The extent to which the present system is likely to injure the water supply may be judged of by the fact that the percolation from the officer's privy has so saturated the subsoil that the well for the supply of the mess kitchen contains the most indubitable evidence of the presence of cesspool matter in it.

It appears to us to be indispensably necessary to proceed at once to improve the drainage of the barracks, and the first thing is to find an outlet. In doing this, we would recommend an inquiry to be made as to whether the barrack drainage could be passed into the town sewers. If so, and if access can be had to them within a reasonable distance, a sufficient outlet will be at once obtained.

If this cannot be done, we would advise the existing outlet to be used under the following conditions, namely, that a cesspit and filter bed should be constructed in the field outside the barrack boundary, on the site of the pool, and that all the barrack drainage, including that from the latrines, should be led into it and filtered, the fluid being allowed to escape as at present, and the solid part being removed at intervals as manure.

If, again, this were objected to, it would be necessary to provide for the daily removal of the urinal and privy drainage by a water-tight cart, and to apply it to land as manure.

In one or other of these methods the whole privy drainage which now saturates the subsoil ought to be got rid of; and if the privy drainage must be dealt with separately, the other drainage might be conducted in drain pipes to its present outlet.

The parade ground should be drained by pipe-tiles laid at least four feet below the surface, and the water conveyed to the same outlet.

As soon as a drainage outlet is provided, all the privies should be reconstructed as water latrines, with divisions of seats, half-doors, and sufficient light and ventilation. All cesspits within the barrack boundary should at the same time be abolished. While these improvements are being carried out, properly constructed urinals, supplied with water for cleansing, should also be provided. One such urinal should be placed near the officers' mess room.

There are several ash-pits in different parts of the enclosure. They are dug out of the ground, and are open to the objection of tending to affect injuriously the purity of the water supply. They should be filled up to the level, and paved and drained. Were this done, they might be used without danger, on account of the open airy situation of the barrack.

Close to the entrance gate of the barrack there is a guard-room and six cells, three are attached to the guard-room and three are in an adjacent range of buildings. Like the remainder of the barracks, both guard-room and cells are of wood. They are not good, and the cubic space they afford is very limited. It is only 328 cubic feet per cell. The guard-room itself gives 316 cubic feet per man to 12 men. There is besides a small lock-up room, intended for 6 men, at 292 cubic feet per man. The guard-room is low in the roof, and has a large circular opening in the ceiling, with a louvre over it for ventilation, but the

room was very close notwithstanding. In this instance it would be well to try the effect of the arrangement in Muir's four-pointed ventilator described in the printed paper of instructions. It is possible that the ventilating power of the louvre might be increased by it. With regard to the cells, we would advise that a larger extent of inlet for air be provided near the stove. A small foul air shaft, with a sectional area of about 8 square inches, should also be carried from the ceiling of each cell to above the roof.

The paymaster's office is at present used as a tailor's shop. It should have a silk flap ventilator into the chimney, and an inlet for air.

The canteen tap-room requires a silk flap ventilator in the chimney, and perforated glass panes in the upper window sashes.

These barracks have no day-room nor drill shed. Accommodation for 36 married soldiers and their families is provided by appropriating nine huts, and dividing each hut into four compartments by partitions. There are also nine rooms for 12 colour-serjeants. No married people sleep in soldiers' rooms.

*The following are the Sanitary Improvements required for Chichester Barracks* :—

1. Reduction of number of men in each infantry hut from 14 to 10.

2. Ventilation of each hut by a shaft and inlet for admitting warmed air, as described. Ventilation of the non-commissioned officers' mess-room and of the tailor's shop by silk flap ventilators and inlets as described. Ventilation of the chapel school through the ridge. Ventilation of the library and infant school by shafts through the roof. Guard-room ventilation to be improved as described. Cells to be ventilated by shafts.

3. Drainage of the floors of the ablution-rooms to be improved by increasing the slope. Gratings and additional pegs to be provided. A bead to be put on the ablution table. A large ventilating skylight to be put in the roof of each ablution house. Fixed baths, with water laid on, to be provided in the proportion of one bath to every 100 men.

4. Women's wash-house to be ventilated through the roof. Water to be laid on to the tubs. A drying and laundry stove and means of ironing linen to be provided.

5. Cookhouses to have each a roasting oven, and a skylight in the roof.

6. The whole barrack area to be under drained, as described, to an outlet obtained in one of the ways suggested. Cesspits to be abolished, and the privies to be converted into water latrines, with divisions of seats, half-doors, light, and ventilation. Urinals supplied with water, to be constructed where required. Dungpit and ash-pits to be filled up to the level, and to be paved and drained.

*Chichester Barrack Hospital.*

This hospital is situated in a prolongation of the barrack area, at its south-eastern corner, and it overlooks the field where the open pool is situated, into which the barrack drainage is received.

It is a large one story wooden building, lined with wood inside, and covered with tiles. It consists of a centre, with two wings projecting behind the line of the main building. Each of these wings contains a long ward, and there are two similar wards in the main building. The wards are entered by a long inside passage running from end to end of the centre part and lighted from the ends. Another passage crosses the central passage at right angles in the middle of the building, to afford access to the kitchens, which are situated behind the hospital.

The surgery, stores, serjeants' room, &c., are situated at the back of the central passage. At the end of the long central passage are spaces cut off for stores by a partition and door. The position is not a good one, for they have a common ventilation with the wards and passage.

There are two orderlies' rooms on the construction, but one of them is used as a provision store, and the other is used as a small ward, so that the very objectionable practice exists in this hospital of one orderly sleeping in each ward among the sick ; a practice which is quite unnecessary, and which ought to be discontinued at once, by restoring the orderlies' rooms to their original design. Better that there be no provision store and no small ward, than that orderlies sleep among the sick.

Although this is a depôt hospital, there is no waiting room for the inspection of recruits.

The following table shows the ward accommodation :—

| Wards. | Present Number of Beds. | Number at 1,200 Cubic Feet per Bed. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| 4 | 64 | 40 | 24 |

Each ward can accommodate about 10 sick, 40 in all, giving about 1,100 cubic feet per bed. This amount of space can be at once obtained by distributing the beds, the present sick not exceeding 4 per cent. of the force ; and two large wards are now empty.

Each ward has four windows, three along the side and one at the end ; some open at top, some only at the bottom.

There are openings in the ceilings of the wards into the space between the ceiling and roof. They are intended for ventilation, but they are not enough, as the hospital is said to smell offensively when shut up.

We would propose to ventilate these wards by one louvred shaft through the ridge over the centre of the ward, which shaft should be connected with each of the openings in the ceiling, and these openings should be enlarged to afford a sufficient area of outlet. The central passage should be ventilated by two similar shafts, one on each side the central entrance, carried up midway between the central entrance and the end of the passage. Additional means of thorough ventilation should also be provided by making all windows to open at top.

A considerable amount of air at present enters the wards through the boarding, but it would be well to provide two inlets near the ceiling, to be covered with perforated zinc cornices, and to have the means of closing, if necessary. The grates should also be remodelled to warm a part of the admitted air.

One source of the bad smell in the building is that there is no ventilation beneath the floors, which are laid on the bare ground. Part of the flooring in one of the wards is decayed in consequence. We are of opinion that openings should be made in sufficient number in the brick foundations to allow the air to pass under the flooring. Part of the roof water is carried off by gutters, but a large part of it falls close to the hospital walls and soaks into the ground. The roof guttering should be carried round the building.

Candles are used for lighting. If gas be introduced into the barrack, it should also be conducted into the hospital.

There is an ablution-room in the yard behind the hospital, with a brick floor, fireplace, and boiler, a bench, basins, and pegs, but there are no gratings for the sick to stand on while washing. There are two slipper baths and one hip bath, but there is no fixed bath, and the room must be reached by walking across the yard in all weathers. It is not such a place as sick should be sent to wash in, for ablution and bath rooms should always be connected directly with the wards. In default of this, in the present case we would advise a fixed bath, with hot and cold water laid on, to be provided in the present room ; and that, if practicable, a covered communication be formed between the hospital and the ablution-room

for protecting the sick in going from the one to the other.

Next the ablution-room is an excellent kitchen, well supplied with the means of cooking hospital diets. It has a Flavell's cooking range, which is stated to answer very well in this case, although reported against in others.

Adjoining the kitchen are the pack store and dead house. The former is good and sufficient, but it has no stove for keeping the air dry. This deficiency ought to be supplied.

The hospital drainage is of the same character as the barrack drainage. It is altogether defective. Some of the gutters close to the wards had foul water lying in them, and between the outbuildings and the boundary wall there is an open sewer or drain with foul water and mud in it.

There are no water-closets, but only privies over cesspits in the backyard, within a few yards of the pump which supplies the hospital with water. Improvements ought to be carried out in the drainage at the time the barrack drainage is reconstructed. The cesspits ought to be filled up, and drained water latrines substituted for the privies. A covered communication should also be made between them and the wards.

There is no accommodation for the sick of soldiers' families.

*We would recommend the following Sanitary Improvements to be carried out in this Hospital:—*

1. The sick to be more equally distributed in the four wards, to give as near as may be 1,200 cubic feet per bed.

2. Each ward to be ventilated by a louvred shaft carried up from the ceiling, as described, and by two inlets for air. Passage to be ventilated by two shafts from the ceiling. Ventilation to be introduced beneath the floors. All windows to be made to open at top. Grates to be remodelled to warm part of the admitted air.

3. A fixed bath, with hot and cold water laid on, to be provided in the ablution-room. Gratings for the feet to be provided. Ablution-room to be connected, if possible, by a covered communication with the hospital.

4. The whole hospital drainage to be improved, together with the barrack drainage, and carried to the same outlet. Roof guttering to be put round the whole hospital. Cesspits to be abolished, and the privies to be reconstructed as water latrines, and connected with the hospital by a covered passage.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, March 23, 1859.*

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## BRIGHTON BARRACKS.

SIR,

We have the honour to transmit the following report of our inspection and inquiry into the sanitary condition of the Brighton barracks.

These barracks are two in number, one for cavalry, situated at a short distance to the north-east of the town; the other for infantry close to the Pavilion. Both barracks are now occupied by cavalry, and the horses belonging to the men in the infantry barracks are kept in the stables of the Pavilion. The cavalry barrack is in the country, and occupies a not unhealthy site, but the infantry barrack is in an unhealthy locality, within the town.

The amount of sickness among the troops in occupation has been very considerable. We learn from a return made to us by the medical officer of the 6th Dragoon Guards, that between the 1st May 1855 and December 1st, 1857, a period of two years and seven months, out of a strength of 464 men there were 1,641 admissions to hospital, so that a number equal to the entire force must have passed through hospital nearly every eight months during the period. The total deaths during this period were 13, of which nine arose from fever, cholera and diarrhœa. The facts go to show that, making allowance for other causes of disease unconnected with the buildings, there must be some serious sanitary defects in one or other or in both barracks, and what these are we shall presently show.

### 1. THE CAVALRY BARRACK.

This barrack is situated on the left-hand side of the road from Brighton to Lewes, close to the Brighton water-works, and immediately outside the borough boundary. It lies in a valley, with a lofty embankment of the Lewes and Brighton railway rising immediately behind its boundary wall. The subsoil is chalk, and the area within the barrack enclosure is 11A. OR. 2P.

The ground is in form a parallelogram extending along the road, and there is a gentle slope of the ground towards the road.

The barrack buildings are placed the lengthway of the enclosure, and consist of three blocks in line, running from N.E. to S.W., the front facing the S.E. The hospital, which stands in the same enclosure with the cavalry barrack, serves for both cavalry and infantry barracks.

At the S.W. end are officers' quarters. At the N.E. end are the riding school and stables with soldiers' rooms over them, and between the blocks are the forage stores.

Behind the blocks, and built along the back boundary wall, are the cook-house, wash-house, ablution-room, privies, dung-pits, &c. At the N.E. extremity of the enclosure is placed the hospital, and along the N.E. boundary wall there is a range of temporary one-story buildings used for workshops, library, school-room, &c. All the permanent buildings are of brick, and are old.

Some of the men's rooms are in attics over the riding school and officers' quarters, but the majority are placed over the stables, and consist of one story and an attic.

Like the rooms in most other cavalry barracks, they are arranged on two sides of a long central corridor extending from end to end of the block, and are reached by two inside stairs of stone in the length of the block, and an outside stair at one end.

The corridor is about 200 feet long and about four feet in width, and has a window at one end, and a glazed door at the other. A little light is admitted at the point where the staircases open on the corridor, but otherwise it is simply a long dark passage, depending for what little light it has mainly on the casual opening of the barrack-room doors.

This corridor is as imperfectly ventilated as it is imperfectly lighted. The only escape for foul air from it is by the stairs leading to the attics, which are used as men's rooms, and were partly so occupied at the time we were there.

Out of the corridor there open 10 serjeants' rooms and 20 troop-rooms. The latter are all of the same size, namely, 27 feet 6 inches long by 17 feet broad, and 8 feet 3 inches high. They have each two windows on one side, with a small sliding window over the door, or in the partition dividing the room from the corridor. The windows are not placed equally in the length of the room, but are at the end opposite the door, and there is space for a third window in the wall, occupied at present by a blank window, which might be opened with great advantage to the healthiness of the rooms. The rooms are not so comfortable as they would have been if, instead of placing the door close to the fire, it had been put at the opposite end of the room. Such an arrangement would have improved both the ventilation and warming.

Over the troop-rooms are seven attics; there are two attics over the riding-school, and two over the

officers' quarters. They are open to the roof, but have a plastered ceiling inside the rafters.

These attic rooms extend nearly across the building, and are lighted by dormer windows in the roof.

The total accommodation afforded by the different classes of rooms is for 422 non-commissioned officers and men, the details of which, as regards the men's rooms, are given in the following table :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 20 Troop - - - | 180 | 140 | 40 |
| Attic D. 1. - - - | 16 | 14 | 2 |
| „ „ Stair - - | 26 | 18 | 8 |
| „ E. 1. - - - | 24 | 18 | 6 |
| „ „ Stair - - | 14 | 12 | 2 |
| „ „ 2. - - - | 24 | 20 | 4 |
| „ F. 1. - - - | 20 | 15 | 5 |
| „ „ Stair - - | 26 | 20 | 6 |
| Over Riding School : | | | |
| 1. - - - | 22 | 18 | 4 |
| 2. - - - | 28 | 20 | 8 |
| Over Officers' Quarters : | | | |
| 1. - - | 10 | 9 | 1 |
| 2. - - | 12 | 10 | 2 |
| Total - - - | 402 | 314 | 88 |

Each of the 20 troop-rooms in this table has regulation accommodation for nine men in a space where no more than seven men ought to be, and in order to approach 600 cubic feet per man, two men should be removed out of each troop-room. The excess of numbers in each attic is shown by itself. It appears, therefore, that the cubic space in these barrack-rooms will not accommodate more than 314 men, and to do this, it is necessary in every case to give less than 600 feet per man, by leaving a man in the room instead of removing him, as none of the rooms will divide into spaces of 600 cubic feet without leaving a balance, which we have counted as one man's space.

The attic rooms are far from being healthy, and most of the cases of small-pox, a disease which has recently prevailed in the buildings, have come from these rooms.

Each of the troop-rooms has a perforated plate in the ceiling, close to the chimney, which is stated to open into a shaft carried up into the ridge of the attic. This is intended for ventilation, but it is of little or no use. We would propose to deal with the ventilation of the building as a whole, and in doing so the first thing is to provide that the corridor be properly lighted and ventilated.

To effect this we would propose that two square shafts be carried up from the ceiling of the corridor, through the attic to the ridge of the buildings. They should be placed at as nearly as may be equal distances from the opposite ends of the corridor, and from each other, having respect at the same time to the position of the stairs, which, as already stated, afford a certain amount of light. The shafts should, in short, be carried up in the darkest parts of the corridor. Their breadth should be the same as the breadth of the corridor. They should be carried straight up through the ridge, and covered with a properly ventilated skylight, and they should be plastered inside.

While this is done perforated glass panes ought to be placed in the window and door at the opposite extremities of the corridor, and also into all the stair windows.

Every troop-room ought to be ventilated separately. The covers should be removed from the ventilators in the ceiling, and in every instance where these ventilators are connected with a shaft, the shaft should be carried above the roof, to afford an independent outlet for the foul air of every barrack-room. In rooms where there are no shafts a shaft should be carried from the ceiling to above the roof. Each room should also have an inlet for fresh air inserted close to the ceiling of the outer wall at the end of the room farthest from the air shaft. It should be covered within the room with a perforated zinc cornice for diffusing the air.

The attics should be ventilated by a louvred ventilating turret, carried up through the ridge of each room. Each non-commissioned officer's room having a shaft should have it prolonged above the roof, and where there is no shaft the room should be ventilated by a silk flap ventilator into the chimney.

All the barrack-rooms are warmed by the old pattern grate, and a large amount of fuel is wasted in consequence. A remodelled grate with warm air admitted should be introduced instead of the present one.

In order to prevent, as far as practicable, the fumes from the stables entering the barrack-rooms, we would recommend that a shaft a foot square be carried up from each corner of the stable to above the roof. These shafts should be carefully lined with soldered zinc, to prevent any escape into the barrack-rooms. The stable windows should be enlarged to give more light.

We may mention, as influencing the purity of the air in the men's rooms, that the drainage and paving of the stables is complained of as being very defective, leading to a filthy state of the surface, and that there are no litter sheds, so that the litter is spread out to dry immediately under the barrack-room windows. Sheds should be provided at a short distance from the building, leaving a passage for air between.

The barrack-rooms are lighted with candles, instead of which we would recommend a ventilated gas-burner to be introduced into each room.

There is a small school-room, used both for adults and infants. It is in the one-story buildings, at the northern end of the barrack square. It is not ventilated, and its warming is defective. To improve both we would recommend that a shaft be carried through the ceiling and roof, and a small Cundy's stove put up, by which part of the air admitted for ventilation can be warmed.

A part of the school-room has been partitioned off as a library, but it is very small, and only sufficient to keep the books under lock and key. There is no room for reading except the school-room.

A long building close to the back boundary wall, near one end of the barrack range, is used as an ablution house. It has a slate table, and 18 water taps, and the same number of water basins. The ablution table requires a bead, to keep the water from dashing over on the men. Pegs are also required to hang clothes on while washing, and the room requires a ventilator in the roof.

This ablution-room is too far from the men's rooms at the opposite end of the range. It is besides not large enough for the force, and we would recommend that another ablution-room be constructed nearer the other end of the barrack. There are no baths, and space for four will be required. One or two might be placed in the present ablution-room, and space for the others might be provided in the new room.

There is a woman's wash-house close to the ablution-room. It has benches, gratings, and boilers, and appears to be quite large enough for the requirements of the barrack. It is nevertheless defective in its internal arrangements. We would recommend its being fitted up with fixed tubs, and water to be laid on. The boilers should be re-set to consume less fuel, and a small drying closet should be put up, for which there is space enough. There should likewise be a table for ironing linen.

Means of drying and getting up linen are essentially necessary in all barracks. The want of such accommodation has a very injurious effect on the health of the men. When the weather is unfavour-

able, large quantities of wet linen are carried into rooms and kept there, saturating the air with moisture, until an opportunity of drying the linen presents itself, and it is never certain that the men do not put on damp linen. A proper drying apparatus could easily be attached to this wash-house.

We understand that it has been proposed to build a new wash-house at a cost of 560*l.*, which appears to us to be an unnecessary expense.

Means of cooking are provided in a large cook-house, with 20 boilers arranged round a central shaft, and recently a brick baker's oven has been erected in it. The cook-house is well lighted and ventilated.

Water is obtained by contract, from the works of the water company adjoining. There are wells behind the stables, but they do not supply water.

These barracks are only surface drained, and the drainage has its outlet into a ditch by the road side, from whence it flows into a pond. This outlet could not be used for the drainage from latrines, and it will therefore be necessary to find another.

The town of Brighton is partially drained, and if the sewers are laid near to the boundary of the borough, and permission could be obtained to pass the barrack sewage into them, the readiest way of draining the barrack would be to lay a 9-inch pipe along the side of the road to the nearest sewer ; but should there be no sewer sufficiently near, or should it be impossible to obtain permission to drain into it, some other means must be found for disposing of the sewage, and it appears to us that it would be practicable to remove it in the manner described below.

The privies are not drained, but they communicate directly with the manure pits, two privies to each pit. The contractor uses the pit for mixing up the soil with stable dung and ashes, a process which occasions great nuisance.

This method of disposing of the barrack refuse is entirely objectionable, and should be put a stop to ; but it cannot be done unless the privies be drained.

The first thing, therefore, is to decide where the outlet is to be. In the event of there being no access to the town sewers, we should recommend that a closed iron manure tank be erected, near to the boundary wall at the lowest attainable level, and that the tank be sufficiently raised to admit of a closed iron manure cart being placed so that the tank could be emptied into the cart by a valve. If the iron tank could not be placed at such a level as to discharge its contents into a cart, a hand pump would be required for the purpose. The drains from all the privies should be led to the tank, which would receive the daily flushings. We would propose further to convert the privies into water latrines, on Macfarlane's principle, because his latrines require a very small amount of water, and would necessitate a small amount of cartage for removing the sewage. With due care, we are of opinion that this method of getting rid of the soil might be adopted without nuisance, and the matter removed would be valuable manure.

When the privies are reconstructed as water latrines, they should have divisions of seats, half-doors, with sufficient light and ventilation.

All the water-closets within the enclosure should be drained in the same manner, and the cesspits abolished.

The manure pits ought to be filled up to the level of the ground and paved, and the ash-pits ought to be dispensed with. A system of daily cleansing might easily be carried out, whereby little or no accumulation of putrescent matter would take place.

The means of pursuing trades in these barracks consist of one saddler's shop, one for shoemakers, two tailors' shops, and two forges. The tailors' shops require ventilation by a shaft and inlet of the usual construction.

A long one-story building at the gate contains the guard-room, three cells, and the orderly room. The guard-room is low ceiled, and has no means of ventilation. It requires a foul-air shaft and remodelled grate to warm part of the admitted air. The cells are warmed and ventilated, but they are very small, giving only 576 cubic feet to each prisoner.

At one end of the guard-room is an open privy and cesspit, and beside it there is a urinal, apparently without drainage, used also as an ablution place by the soldiers on guard, who wash in an old bucket.

These arrangements illustrate some of the common deficiencies at present existing in guard-rooms, and they should be dealt with under some general system.

Each guard-room should be ventilated and properly warmed. It should have a drying-closet, a water latrine, and urinal properly drained and supplied with water, and a suitable place for the men to wash in.

The canteen tap-rooms require silk flap ventilators in the chimneys, and perforated panes in the windows.

There are no day-rooms, drill sheds, nor married quarters. Troop-rooms are temporarily used for the latter purpose.

There is no serjeants' mess or kitchen, and two nine-men rooms have been taken from the construction for these purposes.

There are no quartermaster's stores, and two attics are temporarily fitted up instead, for which indeed they are better adapted than for barrack-rooms.

There are two good ball courts, but they are uncovered, which renders them useless in wet weather, during which the men remain in their barrack-rooms, instead of taking exercise.

*The following is a Summary of the Sanitary Improvements required for the Cavalry Barracks.*

1. Reduction of the numbers of men in all the rooms to the extent stated.

2. Corridor to be lighted and ventilated by two shafts carried up to the roof, with ventilating skylights above, and perforated glass panes to be put into the upper row of all the windows in the corridor and staircases.

3. Stables to be ventilated by a shaft lined with zinc carried from each corner above the roof. Stable windows to be enlarged.

4. Troop-rooms above the stables to have the covers removed from the ventilating shafts, and each shaft to be carried above the roof. Where there are no shafts a wooden shaft to be carried from the ceiling to above the roof. Each attic room to be ventilated by a louvred ventilating turret carried up through the ridge.

Each troop-room to have one inlet for air with a perforated zinc cornice. The blank window in each troop-room to be opened and glazed.

Non-commissioned officers' rooms to have their ventilation improved in the same manner as that of the troop-room. School-room, to be ventilated by a louvre through the roof, and one of Cundy's stoves to heat the air admitted. Tailors' shop to be ventilated by a shaft and inlet. Canteen tap-rooms to be ventilated by silk flap ventilators in the chimneys and perforated panes in the windows.

5. Barrack-room grates to be remodelled to save heat.

6. A ventilated gas-burner to be introduced into every-barrack room.

7. A second ablution house to be built, four baths to be introduced, two in each house, with water laid on. Pegs to be provided in the present ablution house, and ventilation through the roof.

8. Women's wash-house to be provided with fixed tubs, and water laid on. Boilers to be re-set, and means of drying and getting up linen provided.

9. Barrack drainage to be improved. Privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation ; and to be drained, and the sewage disposed of in one of the ways mentioned. All water-closets to be drained, and the cesspits abolished. Urinals to be reconstructed, and supplied with water.

10. Manure pits to be filled up to the level. Ash-pits to be abolished, and arrangements made for the daily cleansing of the barracks.

12. Guard-room to be ventilated and warmed by

a shaft and re-modelled grate. Privy to be converted into a water latrine, urinal to be drained and supplied with water, and proper means of ablution to be provided.

*Cavalry Barrack Hospital.*

This building is situated at the northern angle of the barrack enclosure. It has high ground and a wall behind it, and a high wall at a short distance from the northern end. The situation is therefore somewhat confined, and as the whole line of barracks and stables, with their outhouses, is situated to windward, the air which supplies the hospital is not so pure as it ought to be. The hospital is two stories high, and consists of two wings and a centre. The wings project beyond the centre, both back and front, and contain two wards each. In the centre is a wide passage and entrance hall, on one side of which is the surgery, and on the other the hospital serjeant's room. On the upper floor of the centre there is a small ward, which, at the time we were there, contained six cases of small-pox, crowded into a very small cubic space, because there was no other accommodation for them in the building. Beside this ward there is a pack store, which is complained of as being too small.

There is no orderlies' room, and the attendants have to sleep in the wards among the sick. There is no prisoners' ward, and no place for inspecting recruits, who have to be examined in the long ward before the patients.

The four larger wards are light and cheerful, on account of the number of windows. They are 40 feet long by 20 feet wide, and are entered from the middle of their length. Being at the ends of the building, and at the same time extending from front to back, they have windows on three sides, one window at each end, and five windows along the outer side. The small ward has two windows to the front.

The ground floor wards are 11 feet high, and the upper wards nearly 10 feet.

All the wards are crowded with beds, as will be seen by the following table :—

| Wards. | Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| 1 - | 12 | 7 | 5 |
| 2 - | 12 | 7 | 5 |
| 3 - | 12 | 8 | 4 |
| 4 - | 5 | 2 | 3 |
| 5 - | 12 | 8 | 4 |
| Total - | 53 | 32 | 21 |

The wards will not divide equally into spaces of 1,200 cubic feet each, and we have in the above table given considerably less than that amount per bed. Thirty-two beds, therefore, is the maximum number which these wards ought to contain.

There are no sufficient means of ventilation provided in the building. In the ceiling of each ward are inserted perforated plates communicating with a few small openings in the wall outside, but they are not enough for renewing the air.

We would propose to carry a foul air shaft from the ceiling of each ward to above the roof, and to provide the four large wards with two inlets for air, one at each end, and one inlet for the smaller ward. A few panes of perforated glass should be placed in the upper sashes of the passage windows, to afford air to the passages and staircase.

Each of the larger wards is provided with two fireplaces and old pattern grates. The result is that the fuel rations do not properly warm the wards.

One good remodelled fire-grate would diffuse more heat than both of the present fires, and with a large saving of fuel. Were proper grates put up, a better plan of providing an outlet would be to close one of the existing fire-places, and to use it as a foul air shaft, by making an opening into it, double its sectional area, close to the ceiling. This would be the best way of arranging both for warming and ventilating the wards.

There is no gas in the hospital. We would recommend that it be introduced, and that a ventilated gas-burner be supplied to each ward.

There is no ablution or bath room in the hospital. A suitable room, with one bath, having hot and cold water laid on, and a proper ablution table, with sunk basins, might be easily provided in the manner about to be mentioned.

Behind the hospital is a wash-house, with a bench and gratings, but it has no fixed tubs, and no means of drying or getting up hospital linen. Similar improvements should be introduced into this as into the barrack wash-house already described. Fixed tubs, with water laid on, a drying closet, and means of ironing patients' linen are required.

There is a good kitchen behind the centre of the hospital, connected with it by a passage, and supplied with the means of cooking hospital diets. It is 30 feet high, and extends the whole height of the building. This is quite unnecessary. The upper part, if cut off from the kitchen, would afford a floor area 16 feet by 12 feet 10 inches broad, with ample height, and capable of supplying part of the accommodation required for the hospital. We would propose to throw joists and a ceiling across the kitchen, at the level of the first floor, providing at the same time that a ventilating shaft, a foot square, be carried up from the kitchen through the new ceiling, and above the roof, and that louvred panes be put in the upper sashes of the kitchen windows. We would propose to make an entrance to the space so recovered by a door or doors on the upper floor of the hospital, and to take off so much of the space as would be required for a bath and ablution table. The hot water pipes for the bath might be carried directly from the kitchen to the bath-room. The remainder of the space might be set apart for orderlies, and windows would have to be opened into it. At a comparatively small cost, a great addition might thus be made to the hospital.

There is an ample water supply, derived from the mains of the Brighton Water Company. A great defect is the entire want of drainage, the whole sewage being received into a cesspit close to the ward walls. This requires immediate attention, and the only way to remedy it is to drain the hospital to an outlet along with the barrack, and to fill up the cesspits.

There is one water-closet on the upper floor of the hospital, and the remainder of the accommodation for the sick is supplied by open privies in the yard behind the building. These privies should be drained, and converted into a water latrine on Macfarlane's principle, and the cesspit filled up. Very near to, and in front of the hospital is an offensive privy and cesspit belonging to the workshops. It is not required, and ought to be removed. An ash-pit situated in the hospital yard ought also to be removed, and the refuse carried away daily.

There is no provision nor bedding store, and there is no accommodation for the sick of soldiers' families.

This hospital is too small for the strength, and is destitute of certain obvious conveniences. It could, however, be easily added to by prolonging the end wards in their length, by which the required cubic space could be obtained.

*The following are the Sanitary Improvements we would recommend to be at once carried out :—*

1. Reduction of number of sick in each ward to the extent pointed out.
2. Ventilation of all the wards by a shaft from

the ceiling to above the roof, and by inlets as described. Remodelling the ward grates to save heat.

3. Introducing gas into the building, and supplying a ventilating gas-burner to each ward.

4. An ablution and bath room, with a proper hospital ablution table, having fixed basins, and a bath with hot and cold water laid on, to be provided in the manner pointed out.

5. Hospital to be drained, and the cesspits abolished. Privies in the yard to be reconstructed as a water latrine, with drainage. Privy and cesspit in front of the hospital to be removed, ash-pit to be filled up, and the refuse to be taken away daily.

Lastly, the hospital should be extended to afford the required accommodation for the strength, and a ward should be set apart for the sick of soldiers' families.

### 2. Brighton Infantry Barrack.

This is a very bad barrack, in a close, confined part of Brighton, opposite the Pavilion stables. It is built on ground held on a lease since 1808, nearly expired, and was intended solely as a barrack for a detachment of Foot Guards doing duty at the Pavilion when it was a royal palace. It has, therefore, no officers' quarters, and is destitute of many necessary barrack conveniences.

The site is a close and unhealthy one, and is surrounded by cottage houses, the back offices of which come close up to the barrack-room windows.

The area within the enclosure is one acre and three perches in extent, and the subsoil is chalk. The men's barrack-rooms are in five houses, in two flats, and the stair and passage of each house are both taken out of the rooms, as no space for a staircase has been left in the plans. Each room has three windows, two at the end opposite the entrance, and one near the door. In the lower rooms the back windows look on a high blank wall, at a few feet distance. Each room has regulation space for 16 men. The following table shows the details of the accommodation :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 cubic feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 18 | 288 | 180 | 108 |

If this barrack is to be retained, it ought on no account to have more than 10 men in each room.

The rooms are not ventilated. They have swing windows, which are always being broken, and there are perforated plates in the ceiling communicating with the open air, but they are of little or no use in renewing the atmosphere within the rooms. We would advise that each room be provided with a foul-air shaft, carried up from the ceiling to above the roof, and an inlet for air should also be provided at each end, and covered inside the room by a perforated zinc diffusing cornice. Each staircase window should have perforated glass panes in it for ventilation.

Fire-grates of an old pattern are used for warming the rooms. They ought to be remodelled to save heat.

Although gas is at hand, all the rooms are lighted with candles. We would recommend a ventilated gas-burner to be introduced into each room.

There is no day-room or library, and, properly speaking, there is no school-room, although a troop-room has been temporarily set apart for this latter object. It requires a shaft and inlet for ventilation, like the other barrack-rooms.

There is a tolerably good ablution house with slate benches, water-taps, and basins, situated at rather too great a distance from part of the barrack. It is too dark, and it has no pegs for hanging clothes on. We would recommend additional light to be given through the roof, and a sufficiency of pegs to be provided.

There are no baths. Space for two might be found in the ablution house.

Additional facilities are required for washing linen. The present wash-house has boilers, and benches for tubs, but nothing else. It should have fixed tubs, with water laid on, a drying stove, and means of ironing linen.

There is a tolerably good kitchen provided with boilers, and recently an oven has been added. This latter is apparently good and of economical construction.

An abundant water supply has just been provided for this barrack from the mains of the Brighton Water Company.

There is no drainage except surface drainage, and even this is defective, from the rough nature of the pitch stone pavement in use.

The privies are in a most abominable condition. They consist of a long open seat over an enormous cesspit, the only cover of which consists of the boarded floor of the privy. This cesspit is emptied only at the interval of years, and is a dangerous nuisance, not only to the barracks but to the neighbourhood.

The whole establishment should be properly drained into the town sewers, and those privies ought to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation, and the cesspits ought to be filled up.

Another similar nuisance exists at one end of the barrack range, close under the windows of the soldiers' rooms. It is a large deep offensive ash-pit, so placed that the emanations from it must infect the surrounding atmosphere. This nuisance ought to be abolished forthwith ; the ash-pit ought to be filled up, and an iron cart provided for the daily collection and removal of barrack refuse.

There are no non-commissioned officers' quarters nor mess-room on the construction. There is no drill shed. The boundary wall on one side is so low that soldiers can break out of barracks by climbing over it.

Although at present occupied by cavalry, there are no stables and no officers' quarters belonging to this barrack. In order to supply the deficiency, the stables and riding school belonging to the Pavilion are rented from the Corporation for short periods.

The stables consist of a circular court covered by a large dome, partly of glass, and with large ventilating apertures at the summit. Round the ground floor of this dome are ranged the stables, the only light and ventilation of which come from the court. Above the stables is a circular gallery giving entrance to what were formerly the rooms of the stable servants, and which are now set apart for cavalry officers. The whole arrangements of these stables, however fine they may be in appearance, are amongst the very worst for either men or horses that could be devised. It is impossible to ventilate them except at a large outlay, for the whole interior of the dome, although all the passages and ventilators were open, was close and offensive. It was like the inside of an unventilated stable with the doors shut. The officers' rooms were in the same condition, and it was stated to us that at night the smell in them is past endurance. The rooms are low, badly lighted, and unventilated attics, not fit for habitation ; and it can only excite surprise that they were ever thought of as officers' quarters. There are other officers' quarters, not much better, in high buildings round a narrow court in which a manure heap had been placed. We would recommend all of them to be given up forthwith, and other quarters to be provided.

The riding school has a large number of horses stabled in it, and the ventilation was very bad at the time we were there ; something might be done to improve it by large louvres in the roof on Muir's or Watson's principle.

With regard to the infantry barrack itself, the best thing to do would be to give it up. It would be much better to erect huts for the men than keep them there. We have no doubt that part of the heavy sick and death rate from zymotic disease we have mentioned is due to this barrack. If, however, it must be used, we should advise the following sanitary improvememts to be carried out without delay :—

1. Reduction of the number of men from 16 to 10 men per room.
2. Ventilation of every barrack-room and the school-room by a shaft and two inlets for air. Ventilation of the staircase by perforated panes of glass in the windows. Fire-grates to be remodelled.
3. A ventilated gas-burner to be introduced into each barrack-room.
4. Ablution house to be lighted by glass slates in the roof, and to have pegs put up. Two baths with water laid on to be provided.
5. Wash-house to have fixed tubs and water laid on ; and a drying stove and means of ironing linen to be provided.
6. Privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation, and the cesspit filled up. Ash-pit to be filled up, and an iron cart provided for the collection and daily removal of barrack refuse.
7. Officers' quarters in the Pavilion stables to be evacuated.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, March 23, 1859.*

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## EXETER AND BRISTOL.

SIR,

WE have the honour of laying before you the following interim report of our enquiry and examination into the sanitary condition of the barracks and hospitals at Exeter and Bristol.

### I. EXETER.

There are two barracks near this city, one for cavalry, situated in the immediate outskirts ; the other, for artillery, at Topsham, at a short distance in the country.

#### 1. THE CAVALRY BARRACK.

This barrack is situated on a hill to the west of the town, about half a mile from the river Exe. The site is isolated from buildings. It is seven acres and three quarters in extent, and the subsoil is clay. The ground has a good slope from the highest point towards the main road.

The buildings are of brick, and were erected in 1794–95. They lie nearly north and south, and form three sides of a parallelogram. Along the highest end of the ground are placed the officers' quarters, the riding school, and orderly room. Along the two sides are the stables, with one floor and an attic of men's rooms over them. In the same line, on each side, are other buildings, workshops, privies, the hospital, canteen, &c., and the fourth side of the parallelogram is completed by the gate, guard-room, cells, &c.

Surrounded by these buildings there is a large central parade ground. It is surface-drained, and has a good fall, but not being under-drained it was soft and sloppy at the time we saw it. The whole area requires to be tile-drained to render it dry and firm.

The ground along the barrack ranges, as well as the interior of the stables and the back yards, are paved with boulders, very rough, and not conducive either to cleanliness or to good surface drainage. Whenever this paving requires renewal, close square setts ought to be substituted for it throughout.

The barrack rooms are over the stables, and enter right and left from a central corridor, imperfectly lighted and ventilated, and extending from end to end of the range. This corridor is reached from below by two stone staircases, placed at about a quarter of the length of the range from either end. It is lighted by a window at each end, which windows are separated the one from the other by the whole length of the range ; and about the middle there is a wooden grating in the ceiling of the corridor, used for raising stores to the attic, through which a little light is admitted to a small area of the corridor from a skylight in the roof above.

Both the lighting and ventilation of this corridor require to be improved, by carrying up two plastered shafts the square of the entire breadth of the passage from its ceiling to the roof, and admitting light and air from above by a large ventilating skylight. The end windows of the corridor also require perforated panes of glass in their upper sashes, for the admission of fresh air. The attic itself is used for stores and workshops, and in one part of it there were a few men quartered. In its present state it is not fit for occupation by men.

The barrack-rooms enter right and left from the corridor, and hence they have windows to the open air only on one side. Some of the rooms have three windows, but some have only one window, placed near the fire, leaving by this arrangement the whole end of the room in darkness. In all the rooms having one window another window ought to be opened.

The total regulation accommodation of the barrack-rooms is for 204 non-commissioned officers and men. There are 24 soldiers' rooms, containing, with two or three exceptions, 8 men in each, having about 540 cubic feet per man. The following table shows the number of men required to be removed in order to allow 600 cubic feet for each :

| Rooms. | Total present Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Right Wing :— | | | |
| No. 5 - - - - | 6 | 5 | 1 |
| Nos. 6, 7, 8, 9, 10, 11, 13, 14, 15. | 72 | 63 | 9 |
| No. 12 - - - - | 8 | 5 | 3 |
| Nos. 18, 19 - - - | 10 | 8 | 2 |
| Left Wing :— | | | |
| No. 4 - - - - | 8 | 5 | 3 |
| Nos. 5, 6, 7, 9, 10, 11, 12, 14, 15, 16. | 80 | 70 | 10 |
| Total - - | 184 | 156 | 28 |

This table shows a deficiency of sleeping space for 28 men.

By removing three men out of No. 12 in the right wing, and out of No. 4 in the left wing, and one man out of each of the other rooms, 600 cubic feet will be left for the remaining inmates.

Although the rooms have openings in the ceilings with sliding covers, none of them are properly ventilated. To provide for this, a shaft will have to be carried from the ceiling of each room above the roof, and an inlet for air, covered within the room by a perforated zinc cornice, will have to be inserted in the outer wall close to the ceiling. The existing openings in the ceilings ought then to be closed.

Each of the non-commissioned officers' rooms requires a silk flap ventilator in the chimney.

The barrack-room grates are of the old pattern, and might be advantageously remodelled to save fuel.

One barrack-room is used as a school-room and library. It requires additional light and ventilation, like the other rooms.

The stables require thorough ventilation, to prevent the fumes reaching the barrack-rooms above. With this object, shafts, carefully lined with sheet zinc, soldered, should be carried from the four corners of each stable to above the roof of the buildings. Inlets for air should be placed near the ceilings. The stables also require additional window space.

At the foot of each staircase is a large room. One of these rooms in each block is appropriated as a cook-house, and is fitted up with seven boilers. There are no other means of cooking except boiling. A proper ventilated roasting oven is required in each cook-house to supply this defect. The cook-houses are rather dark, and require more window space. They should also be ventilated by carrying a shaft, 18 inches square, from the ceiling through the roof, and perforated panes of glass should at the same time be placed in the upper window sashes.

One of these lower rooms is used as a serjeants' mess, and requires ventilation by panes in the upper window sashes. There are two ablution houses, one in either wing, built against the end wall of the range ; they have each a metal tank, benches, gratings, basins, with water laid on. The rooms are low in the roof, and too dark ; they might be sufficiently lighted by a few glass slates in the roof. They require a louvre in the roof and perforated glass panes in the windows for ventilation. These rooms have no pegs.

There are no baths, but as there is plenty of space and abundance of water, this deficiency admits of easy remedy. A bath house, with two baths, and water laid on, are required.

The women's wash-house is narrow and inconvenient. It has a boiler and gratings, but it has no fixed tubs, and is not provided with means of drying or getting up linen. It requires ventilation by perforated panes in the upper sash of the windows ; fixed tubs, with water laid on, and a drying and laundry stove. Space for drying and getting up linen might be obtained by adding a room on purpose.

The privies were, until recently, of the usual construction, but while we were at the barracks, water latrines, on Salter's principle, were being constructed on one side of the barrack ; similar latrines were to be erected on the opposite side. They will remove the nuisance, but some points in the construction still require improvement. The water receptacles are too deep ; hence they require a great deal more water than is actually needed for receiving and removing the soil. The seats are divided from each other by partitions about two feet high, instead of being carried the height of a man. The buildings containing the latrines are low, narrow, and not light enough; they should be lighted and ventilated through the roof.

The urinals require to be supplied with water.

The water supply for these barracks is abundant and good. It is derived from the works of the Exeter Water Company, and enough can be obtained for any required purposes of health.

The barrack is lighted by candles, although gas can be obtained ; every barrack-room should be provided with a ventilated gas-burner.

There is no day-room nor drill shed.

The library and reading-room, as already stated, is a barrack-room. Separate accommodation for reading is much required.

There is no accommodation for married people except misappropriated barrack-rooms, where families are mixed up together in the most unseemly manner. Married quarters are very much needed in this barrack.

The guard-room is dark, and requires ventilation by a shaft through the roof, and by inlets in the outer walls. Additional light might be supplied by a skylight.

There is no lock-up, but there are four cells adjoining the guard-room.

The canteen tap-room and the room for non-commissioned officers require ventilation by a large silk flap ventilator into the chimney, and by perforated panes of glass in the windows. The upper sash of each window should also be made to open.

*The Sanitary Improvements required for Exeter Cavalry Barracks are as follow :—*

1. Reduction of number of men to the extent stated.

2. Ventilation and lighting of the corridors by two plastered shafts, the square of the breadth of the corridor, carried up from the ceiling to the roof, the shaft to be covered above by a ventilating skylight. Perforated glass panes to be put into the upper sash of the end windows of the corridor.

3. Each barrack-room to be ventilated by a shaft carried from the ceiling to above the roof, and by an inlet and perforated zinc cornice. The library and reading-room to be similarly ventilated. An additional window to be opened in every barrack-room having at present only one window. Every non-commissioned officer's room to have a silk flap ventilator into the chimney. Serjeants' mess-room to be ventilated by a silk flap ventilator and by perforated panes in the windows. Barrack-rooms to have remodelled grates. Guard-room to be ventilated by a shaft and inlet for air. Fire-grate to be altered to warm part of the air admitted ; additional light to be afforded by a skylight. Canteen tap-rooms to be ventilated by silk flap ventilators, perforated glass panes, and by making the upper sash of the windows to open. Stables to be ventilated by shafts lined with zinc, and by inlets ; and to have more window space.

4. Kitchens to be provided with ventilated roasting ovens, to have additional window space, and to be ventilated by a shaft and perforated glass panes.

5. Ablution houses to be provided with pegs ; to be lighted by glass slates, and to be ventilated by a louvre in the roof, and by perforated glass panes in the windows.

6. A bath-house, with two fixed baths, and water laid on, to be provided.

7. Women's wash-house to be enlarged, and provided with fixed tubs, and water laid on, and with a drying stove. Perforated glass panes to be introduced into the upper sash of each window.

8. New buildings for the latrines to be lighted and ventilated through the roof. The divisions to be carried higher up.

9. Urinals to be supplied with water.

10. A ventilated gas-burner to be introduced into each barrack-room.

Lastly. Married quarters and a library are much required at these barracks.

*Cavalry Barrack Hospital.*

This is a separate house, standing in line with one of the barrack ranges on the lower slope of the parade ground. It is two stories high, and is divided up the middle by a wooden staircase affording access to the upper flat. On either side the staircase, both above and below, there is a short corridor with windows, extending right and left, and giving access to the wards, stores, surgery, kitchen, &c.

There are in all six wards ; they are much overcrowded, as will be seen by the following table of accommodation :—

| Wards. | Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 7 | 4 | 3 |
| 2 | 5 | 3 | 2 |
| 3 | 4 | 2 | 2 |
| 4 | 7 | 4 | 3 |
| 5 | 6 | 3 | 3 |
| 6 | 4 | 2 | 2 |
| Total - | 33 | 18 | 15 |

The cubic space of the wards will not divide equally so as to give 1,200 feet per bed. There is in each case a small remainder over that amount, but this building ought not to contain more than 18 or 20 sick at the outside.

The wards entering at the end of the corridor have windows on two ends ; the wards entering from the side of the corridor have windows only on one side to the open air. This arrangement does not admit of proper ventilation or lighting of the wards.

There are openings in the ceiling for ventilation, similar to those in the barrack-rooms, but they are insufficient. It will be necessary to ventilate each ward by a shaft carried up from the ceiling to above the roof, and by an inlet communicating with the outer air on each side, covered by a perforated zinc cornice, for diffusing the air within the ward.

All the ward grates might be advantageously remodelled to save fuel.

The corridors and staircase require ventilation by perforated glass panes in all the windows. If practicable also, an additional window should be made in each end ward.

The kitchen is under one of the wards. It requires ventilation by a shaft carried up from the ceiling to above the roof, and perforated glass panes in the windows.

The wash-house, which is immediately connected with the hospital, is not ventilated, and has no outlet for the vapour. It requires a louvre in the roof. There are no means of drying or getting up linen. A proper stove is needed for this purpose.

There are two water-closets, one on each floor ; they are dark, as well as the lobbies leading to them. The lobbies should have a window on both sides, with perforated glass panes in the upper sashes.

There is no bath-room, except the dead-house, to which patients go to take a shower bath. A proper bath-room, with a fixed bath, and hot and cold water laid on is required. At the time this is done, provision should be made for lavatory accommodation for the sick, of which there is none at present, except the women's wash-house, a most improper place for the purpose.

There is an offensive privy and cesspit in the yard behind the hospital. The privy should be converted into a water latrine, and the cesspit abolished.

This hospital is very defective, both in structure and in internal arrangement, and is not well suited for its purpose. It would do for married quarters, and another hospital might be built with great advantage to the sick.

*The Sanitary Improvements required in the present Building are as follow :—*

1. Reduction of the number of beds to the extent stated, to give 1,200 cubic feet to each patient.

2. Ventilation of the staircase and corridor by perforated glass panes in all the windows, and by additional windows with perforated glass panes in the lobbies leading to the water-closets.

3. Ventilation of each ward by a shaft and two inlets for air, with perforated zinc cornices. Fire-grates to be altered to warm part of the air admitted.

4. Ventilation of the kitchen by a shaft and perforated glass panes.

5. Ventilation of the wash-house by a louvre. Means of drying and getting up hospital linen to be added to the wash-house.

6. A bath-room and lavatory, with one bath and hot and cold water, to be provided.

7. Privy in the yard to be reconstructed as a water latrine, and the cesspit abolished.

## 2.—Artillery Barracks, Topsham.

These barracks are situated close to the high road about a mile and a half from the outskirts of the city of Exeter, on elevated ground, with a good slope to the river Exe, which passes the site at about a furlong distant.

The area within the barrack enclosure is 9½ acres in extent. The site is in the country, and healthy.

All the buildings are of brick, and were erected in 1805–6. They are arranged in an oblong square. The higher end is formed by men's quarters, with the officer's quarters in the centre. Opposite these, near the gate, are blocks of men's quarters, and the barrack offices. On each side the square are the stable blocks, with stores over them.

The parade ground occupies the middle of the square. It is very much raised in the middle, and has no drainage except on the surface, and as the subsoil is clay, the area is wet and sloppy in damp weather.

It would be a great improvement to lower the parade ground in the middle, but at all events it should all be tile-drained, to make it dry and firm.

The barrack-rooms are in separate houses, two stories high, with two rooms on each floor entering from a central passage, and wooden staircase. On the southern side these staircases have windows on both sides ; but on the northern side the stair windows face only to the parade ground. An additional window should be made through the back wall of the staircases on the northern side.

The barrack-rooms have no means of thorough ventilation, from having windows only on one side, with a dead wall opposite, along which the beds are ranged. It would be very advisable to remedy this defect by opening two additional windows in each room.

The rooms vary a little in size. They are from 26 to 30 feet in length, about 20 feet in breadth, and from 8 feet 6 to 9 feet 6 high. They are all 12-men rooms, and allow by present regulation from 380 to 450 cubic feet per man. The total accommodation is for 338 non-commissioned officers and men.

The following table shows the extent to which the regulation number of inmates of each room exceeds the available accommodation, at somewhat less than 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 1, 2, 3, 4, 27, 28, 31, 32. | 96 | 64 | 32 |
| Nos. 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 24, 25, 26, 29, 30. | 240 | 180 | 60 |
| Total - - | 336 | 244 | 92 |

The open airy position of this barrack enables us to allow a larger number of men per room than we should feel disposed to do were the barrack situated in a town, and yet there is a deficiency of accommodation for 92 men. In effecting the required reductions, four men ought to be removed out of each of

the first group of rooms in the table, and three men out of each of the rooms in the second group.

None of the barrack-rooms are ventilated, and as they are also deficient in windows, the atmosphere in them is very close and foul. Besides two additional windows to the back, each room requires a ventilating shaft to be carried up from the ceiling to above the roof, to permit of the egress of foul air, and two inlets for fresh air, with perforated zinc diffusing cornices, one on each side the room close to the ceiling. The fire-grates are of the old model, and waste much heat. These grates should be remodelled for warming part of the admitted air.

Each staircase ought also to be ventilated by a shaft carried up from its ceiling above the roof, and by perforated panes in the windows.

The rooms are lighted by candles. Gas ought to be introduced whenever the mains are brought sufficiently near.

There is no day-room nor school-room. At present there is no library, but one has been provided for in this year's estimates.

There are no ablution houses. The men wash in a stable in which a few basins are placed on the ground for their use. Neither are there any baths.

Ablution-rooms and four baths are provided in the present annual estimate, but the position which has been selected for them is an objectionable one. It is proposed to build them behind the centre of the stable ranges where there are no soldiers' quarters, and at as great a distance as possible from the men's rooms.

A position should be selected for both ablution-rooms and baths, close to the men's rooms, and, if possible, connected with them by a covered communication. The proposed position for them is inadmissible, from considerations of health.

There are two women's wash-houses in rear of the stable ranges; they are small and dull. They have no fixed tubs, and only one boiler each. There are no means of drying or getting up linen.

A proper drying and laundry stove is required. More light should be given through the roof, and fixed tubs should be provided.

There are two cook-houses, one in the rear of each wing. They have each seven boilers, but they have no other means of cooking. Each cook-house requires a roasting oven.

There are no cleaning rooms, and no covered drill sheds; but there are extensive gun sheds at one angle of the barrack enclosure, which might very well be used for drilling in wet weather. It is also proposed to construct a verandah at the orderly room for the men to stand under in bad weather.

The barrack is provided with the usual artillery workshops.

Water is obtained from the Exeter Water Company. It is received in four tanks, each of 3,500 gallons capacity. There are besides nine pump wells and four small rain-water tanks.

The drainage and sewerage of the whole barrack are defective, and require to be carried out on an improved plan. As already stated, the parade ground requires under draining, an improvement which might be advantageously extended to the whole area within the barrack enclosure.

The privies have no drainage, and empty their fluid contents into large open manure pits behind the stable ranges. These pits are deep, and receive the subsoil water from the adjacent ground. One of them was nearly full of water saturated with cesspool matter, the odour from which was most noxious and offensive. At the time we were there, a man was baling out the green stinking fluid on to the surface, over which it was running to the nearest gully grate, whence it appeared to flow back again into the pit; but we could obtain no satisfactory information as to the course of the surface drains.

The remedy for this nuisance is to reconstruct the privies as water latrines with divisions, half-doors, light and ventilation, and to drain them to an outlet. The manure pits should at the same time be filled up to the level of the ground and paved, and provision made for the daily removal of the manure, and other barrack refuse. This could be easily done in connexion with the daily cleansing of the cavalry barrack.

In carrying out these improvements, the first thing to be done is to find an outlet for the drainage. There is an excellent fall to the river, but the outlet would have to be carried through private property. The superficial drainage, as we have been informed, is at present carried in underground drains, partly into a pool in a field near the barrack, whence it flows over a field, and finally into the river.

There is no reason why the privy drainage should not be disposed of in a similar manner. A cesspit would have to be provided in the field, into which the flushings of the latrines would be carried, and the overflow would make valuable manure for grass land, or it might be allowed to run to the river in a roughly paved channel, which would tend materially to deodorize the fluid. The solid matter might then be removed from the cesspit from time to time for manure, but in all probability it would seldom have to be disturbed. Any way an outlet will have to be obtained to abate the nuisance at present existing.

Properly constructed urinals, supplied with water, ought also to be provided.

The guard-room requires ventilation by a shaft, and inlets for air. The lock-up is a long way from the guard-room. It is, in fact, at the opposite end of the barrack enclosure, and there is in reality no lock-up so far as the guard-room is concerned.

There is a troop stable one story high near the guard-room at the end of the nearest block of stables, which would afford a site for a lock-up, but in that case, the stable would have to be rebuilt elsewhere.

The orderly room is also a long way from the guard-room.

A urinal, privy, and ablution-room are required for the guard-room.

There are two cells, but more are required.

There is a good canteen, but the tap and non-commissioned officers' rooms require ventilation by silk flap ventilators into each chimney, and by a pane of perforated glass placed in the upper sash of each window. There are no married quarters in these barracks.

*The following are the Improvements required:—*

1. Reduction of the number of men in each barrack-room to the extent specified above.

2. Opening additional windows through the back wall of each barrack-room. Also in the back wall of each staircase on the northern side of the enclosure.

3. Ventilation of each barrack-room by a shaft and two inlets for air as described. Ventilation of each staircase by a shaft from the ceiling, and by perforated glass panes in the windows. Ventilation of the guard-room by a shaft and inlet. Ventilation of the non-commissioned officers' room and tap room in the canteen by a silk flap valve into the chimney, and by a perforated glass pane in the upper sash of each window. Remodelling of the barrack-room and guard-room grates, to save heat.

4. Ablution and bath-houses to be constructed close to the men's rooms.

5. Women's wash-houses to have additional light through the roof, fixed tubs, and drying and laundry stoves.

6. Each cook-house to have a ventilated roasting oven provided.

7. The barrack to be sewered to an outlet in one of the modes suggested. The parade-ground to be under-drained. All the privies within the enclosure to be reconstructed as water latrines, with divisions, half-doors, light, ventilation, and drainage. All cesspits to be abolished, and the manure pits to be filled up to the surface level.

8. Manure and barrack refuse to be collected and removed daily.

9. A urinal, privy, and ablution-room to be provided at the guard-room.

Lastly, married quarters, a day-room, and reading-room ought to be provided.

*Artillery Barrack Hospital.*

The hospital stands on the north-east of the barrack enclosure, in a space surrounded by a high wall, which impedes the external ventilation of the building. It consists of a centre, two stories high, and two low wings, one story high. The wards are situated in the top flat of the centre buildings, with the exception of one ward in one of the wings, which is on the ground floor. There are in all six wards, with 30 beds. The following table shows the accommodation :—

| Wards. | Number of Beds according to existing Regulation. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 6 | 4 | 2 |
| 2 | 5 | 4 | 1 |
| 3 | 5 | 4 | 1 |
| 4 | 4 | 2 | 2 |
| 5 | 5 | 4 | 1 |
| 6 | 5 | 4 | 1 |
| Total - | 30 | 22 | 8 |

By giving somewhat less than 1,200 cubic feet per bed this building will accommodate 22 sick in these six wards.

The wards are small and unventilated, and the windows only open below. All the sashes must be made to open at the top, and each ward requires a shaft and two inlets for air, similar to those recommended for the barrack-rooms. The ward grates are of the old pattern, and should be remodelled to save heat, and warm part of the admitted air in winter. One of the wards is used by orderlies when not otherwise occupied. If it is required for sick the orderlies sleep among the patients. This practice should be discontinued in all hospitals, and suitable accommodation ought to be set apart for the orderlies.

There is a light roomy hall and staircase in the central building. It requires ventilation by a shaft through the ceiling, and by perforated glass panes in the stair window.

Behind each wing of the hospital there is a small enclosed court-yard, surrounded by one-story buildings, in which are placed not only the privies for the sick and for the officers, but the cesspits into which the privies empty themselves, and which receive the rain water also. They were most offensive and noxious. Close to one of these privies is the bath-room, containing a shower-bath, and a large square dirty looking cistern used as a fixed bath. It has no water laid on. It is uselessly large ; so large, indeed, that it requires a fatigue party to fill it. One side of this court-yard is formed by a sick ward, along the outside of which a covered verandah is carried to afford access to the privy and bath-room.

The court-yard, behind the opposite wing, contains an offensive privy and cesspit, adjoining which, on one side is the wash-house, and on the other side, the kitchen. The surplus water of the yard flows into the privy cesspit.

The wash-house requires ventilation through the roof. It has no fixed tubs, and it was stated that the urine tubs were used as wash tubs. There is no drying stove, or other means of getting up patients' linen.

The first step for improving these outbuildings is to drain the hospital in connexion with the barrack, and to lay on water.

This is absolutely necessary before anything effectual can be done. Next, the cesspits should be abolished, and water-closets put up instead of the present privies.

The bath-room should be reconstructed, the present unsightly and useless bath removed, and a proper bath, with hot and cold water laid on provided. The wash-house should have fixed tubs, with water laid on. It should be properly drained and ventilated, and have a drying and laundry stove provided.

The hospital kitchen is imperfectly provided with the means of cooking diets, and it requires ventilation through the roof. A proper cooking range (one of Flavell's) should be introduced.

There is no ablution-room. Space might be found for the required accommodation in the bath-room. There is no space for receiving the sick of soldiers' families.

*The following are the Sanitary Improvements required :—*

1. Reduction of numbers of sick to the extent stated.

2. Ward windows to be made to draw down at top. Ventilation of each ward by a shaft, and two inlets for air. Ventilation of the staircase by a shaft through the ceiling, and by perforated panes in the window. Ward grates to be remodelled.

3. The hospital to be drained along with the barrack, the cesspits to be abolished, and the privies converted into water-closets, properly ventilated, and with water laid on.

4. Bath-room to be re-arranged, the present bath removed, and a proper bath, with hot and cold water laid on, provided instead. Lavatory accommodation to be likewise provided.

5. Wash-house to be ventilated through the roof, and to have fixed tubs, with water laid on, and a drying and laundry stove provided.

6. Kitchen to be ventilated through the roof, and to have a proper cooking range.

While recommending those improvements as essential for this hospital, we must at the same time express our decided opinion that the buildings would be best applied to the purposes of married quarters, in which case a new hospital would have to be built.

## II. BRISTOL.

There are two barracks in Bristol and its vicinity ; one at the lower end of the city, the other at Horfield, on the Bath road.

### 1. Gloucester Hotel Barrack.

This barrack is the old Gloucester Hotel, which has been taken on lease for receiving and passing recruits, of whom from 300 to 800 are examined and passed every month at this station. About 13 years of the lease are unexpired. The buildings are situated at the foot of a very steep hill under Clifton Downs, and close to the river Avon. The hotel itself consists of several flats of large, lofty, well-lighted rooms, reached by wide staircases lighted from above. One of these rooms is an old ball room, one wall of which is bulged inwards, and has rather an unsafe appearance. The house generally is not in good repair ; and it is deficient in some important points affecting health and comfort. It is true that none of the recruits remain above a few days in the house ; but, although this fact may afford a reason for limiting the expenditure for improvements to the most necessary matters, still the things which are necessary ought to be done.

For example, much of the interior of the house is dirty. Nothing appears to have been done in the way of lime-washing or cleansing the ground floor, staircases, &c. A number of the rooms are papered, and apparently do not require cleansing at present, but the parts that do require it should be lime-washed,

and moreover, paper, on account of its power of absorbing emanations, is a bad material for the walls of rooms in which a large number of persons live or sleep.

Several of the occupied sleeping-rooms are directly overlooked from the windows of the better class of dwelling houses on the slope of the hill immediately behind. The glass in the lower sashes of these room windows has been obscured to a certain extent, but it ought to be done in both upper and lower sashes in all the windows of the soldiers' rooms that are overlooked.

None of the rooms are ventilated. As, however, the numbers of men occupying them vary very much, it is probable that a sufficient amount of ventilation can be obtained by openings into the chimneys. We would therefore advise that a large size silk flap ventilator be placed in each chimney flue throughout the building, including those flues in the ball room, the fire-places of which have been bricked up. Each room will, in addition, require inlets for air; and we think it would probably be sufficient for the purpose to insert a pane of perforated glass into the upper sash of each window.

The staircases should also have more ventilation; which could easily be afforded by openings under the skylights.

The hotel kitchen is used as an ablution-room. The only conveniences it had for the purpose when we saw it were the old kitchen sink and one basin. The place was very dirty. The floor was uneven, and foul water was lying on it. There is no bath.

We would advise that this kitchen be properly drained, cleansed, and repaired, and that the floor be levelled: that an ablution table, with water laid on, gratings, and pegs be provided; and that a bath for washing recruits, similar to the one at the Westminster recruiting office, be constructed.

A small room on the ground floor has racks for hanging up wet great coats, but there are no means of drying them. The least expensive way of supplying this deficiency would be to put a stove in the room, to bring in fresh air from the outside under the stove, and to provide an outlet for the moisture by a silk flap ventilator into the chimney, and by perforated glass panes in the windows.

The hotel scullery is now used as a guard-room, and the wine cellar is the lock-up. The guard-room is rendered unnecessarily dark by having part of the window boarded. The lock-up wants ventilation. For the latter purpose an opening should be made through the wall between the lock-up and the guard-room, and a silk flap ventilator placed in the guard-room chimney. The boards should also be removed from the guard-room window.

There is no cook-house where recruits can cook their meals, except the fireplace in the old hotel bar. It affords no conveniences over those of an ordinary public house. It might be worth while to consider whether the usual method of providing meals for recruits could not be improved, not only at this, but at all recruiting stations.

The usual allowance per head of coal is drawn for each recruit, but as the recruits are not allowed the use of their barrack-rooms in the daytime, and there are consequently no res, it does not appear how the coal is expended.

There is an outbuilding in the yard adjoining the hotel, in which a line of open drained privies has been put up. They are very offensive, and should be re-constructed as water latrines, with divisions of seats and half-doors. The urinals ought also to be supplied with water.

*We would recommend, then:—*

1. That the whole barrack be cleansed, lime-washed, and repaired where necessary, and that all the glass in the windows of barrack-rooms overlooked by neighbouring dwelling-houses be obscured.

2. That a large size silk flap ventilator be placed in every chimney in the barrack-rooms, and one perforated glass pane in every window; that the staircases have additional ventilation at the skylights; that the drying-room be ventilated as described, and be provided with a stove; that the guard-room and lock-up be ventilated as described, and the boarding removed from the guard-room window.

3. That the kitchen be converted into a proper ablution-room and bath-room, and the floor drained and levelled.

4. That the privies be re-constructed as water latrines, with divisions of seats and half-doors, and the urinals supplied with water.

*The Hospital.*

At a short distance from Gloucester Hotel barrack is a small fourth or fifth rate house, which is rented from quarter to quarter as an hospital. It has none of the conveniences of a place for receiving and treating sick. The wards are small bedrooms, and have no ventilation. They could be somewhat improved in this particular by silk flap ventilators in the chimneys, and perforated glass panes in the windows; but even if this were done the place would still be so ill adapted for its object that it might be desirable to set apart a ward for sick in the hotel itself, if it be practicable to do so. There are seldom above one or two sick from among the recruits under treatment at the same time.

Among other defects, the present hospital has no water-closet, but only an open privy in the yard, placed over a drain without any intermediate trap.

*If the present Hospital is to be retained, we should recommend:—*

1. That each room used for sick be ventilated by a silk flap ventilator, and a perforated glass pane, and that means be taken to ventilate the staircase.

2. That the drain from the privy be trapped.

2. Horfield Barracks.

These barracks are built on sloping ground, near the high road from Bristol to Bath, and about four miles from the former city. They are built of stone, are of recent construction, and are intended for the accommodation of 108 cavalry and 320 infantry. They are at the present occupied by the military train. The barrack enclosure is defensible, and the buildings form a square, the upper side of which is occupied by officers' quarters, having the barrack-master's house at one end and the hospital at the other. The infantry barracks extend down the slope on one side, and opposite them are the barrack-master's office and stores, the provost establishment, and the guard.

The cavalry barrack-rooms are over the stables, and front the officers' quarters at the lower end of the enclosure. A riding-school stands in the square in front of the cavalry range. Through the middle of this range there is an archway, over which are placed a reading-room and library, with a librarian's quarter, and serjeants' quarter.

At the higher end of the infantry range are situated the orderly room, pay serjeants' room, and staff serjeants' quarters, and at the lower end are the serjeants' mess establishment, and the tailors' and shoemakers' shop.

Behind the ranges are the usual barrack conveniences, ablution-room, cook-houses, &c., and behind the cavalry range there are the infirmary stables, guard-room, &c.

The general arrangement of the buildings is good, convenient, and healthy.

The rooms in the *cavalry barracks* are above the stables, and are reached by staircases and passages, into which the stables open. They are all of the same dimensions, namely 28 ft. by 22 ft., and 10 ft. 6 in. high. They contain 12 men each. Besides these rooms there are two 6-men rooms in J. house. The accommodation in both sets of rooms is shown in the following table:—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 8 | 96 | 80 | 16 |
| J. House. | | | |
| 9 | 6 | 5 | 1 |
| 10 | 6 | 6 | — |
| Total - | 108 | 91 | 17 |

The cavalry rooms are not of so healthy a construction as the infantry rooms. They are built back to back, with three windows only on one side. The means of light and ventilation are much less advantageous than in the infantry barracks. In the above table we have therefore allowed as near as may be 600 cubic feet of space per man.

None of the rooms are ventilated. Each 12-men room requires a shaft and two inlets for air. The shaft should be carried up from the ceiling near the fireplace to above the roof, and the inlets should be placed in the outer wall, close to the ceiling at each end of the room.

The staircases leading to the cavalry rooms should be ventilated by perforated glass panes in the windows, and the serjeants' room at the top of each staircase should have a silk flap ventilator into the chimney. At the foot of each staircase two doors open right and left into the stables. These doors permit the fumes to pass into the rooms above. They are quite unnecessary, and ought to be built up.

*The infantry barracks* are two stories high, and are arranged in houses containing each four barrack-rooms, and two serjeants' rooms, entered by a common passage and spacious stone staircase. There are two barrack-rooms, and one serjeants' room to each flat. All the rooms are 33 feet 9 inches long, by 20 feet wide. The lower rooms are 11 feet 9 inches high, and the upper rooms are 10 feet 6 inches high. They have all four windows, two on each side to the external air. The windows are of a good height and breadth, and the rooms are well lighted. Each room has regulation accommodation for 16 men, so that the amount of cubic space varies in each flat. The present regulation accommodation, in comparison with what it would be at about 600 cubic feet per man, is given in the following table :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 10 Lower - | 160 | 140 | 20 |
| 10 Upper - | 160 | 120 | 40 |
| 20 | 320 | 260 | 60 |

In every room we have allowed, as nearly as may be, the same amount of cubic space per man ; but as the contents will not divide into equal proportions of 600 cubic feet, we have, in consideration of the healthy structure of the barrack, allowed in every instance less than that amount.

None of the rooms are ventilated. We would recommend that a ventilating shaft be carried up from the ceiling of the room, near the fireplace, to above the roof ; and that two inlets for air, with perforated zinc cornices, be placed close to the ceiling at each end of the room, between the windows. Each serjeant's room requires a silk flap ventilator into the chimney. The staircases should have ventilation provided by panes of perforated glass in the upper sash of each window.

Each room has a fireplace, with a grate of the old pattern. It is in the middle of the length of the room, opposite the door. The position is not a very good one for the comfort of the men, but the defect has been to a considerable extent remedied, by constructing a wooden porch to the door, inside the room. All the barrack-rooms are lighted by candles, and the exterior by oil lamps. There are gas mains within about half a mile of the enclosure, and it is worthy of consideration whether gas should not be supplied to the whole establishment. There is no day-room belonging to these barracks.

There is a good chapel school which has been recently erected. We are informed that in this building the benches have been placed so close together that the men cannot stand up. Additional ventilation might be given with advantage, by raising the ridge tiles. There is no porch to the building, and complaint is made of the cold air rushing in every time the door is opened. An inner porch of wood would remedy the defect.

The barrack is built of a soft cream-coloured stone, which is exposed in the interior of the rooms without being plastered. The surface within the rooms is kept clean by scraping ; but the stone is very porous and absorbent, and would be kept much freer of organic matter by being occasionally washed with quick lime. Were this done, the walls might be scraped at intervals of time with advantage.

The library and reading-room occupy the same room. It requires ventilation by a shaft and two inlets for air. The grate should also be remodelled, to warm a portion of the admitted air.

There are two ablution-rooms ; one behind the infantry barracks, and the other at the east end of the cavalry range. They have ablution tables, with the water laid on ; but they have no gratings for the men to stand on, and no pegs. The ablution tables would be much improved by having a bead at the edge, to prevent the water dashing over upon the men ; and the ablution-houses themselves should have additional ventilation, by perforated panes in the windows.

There are no baths. One for every 100 men will be required.

There are two women's wash-houses, one for the infantry and another for the cavalry. They have boilers and washing tubs, but they have no means of drying or getting up linen. The wash-house belonging to the infantry barracks, requires additional light by glass slates in the roof. The cavalry wash-house should have a louvre in the roof for ventilation. Water should be laid on to the washing tubs, and one drying and laundry stove would probably be found sufficient for the two barracks.

There are two cook-houses for the infantry, and one for the cavalry. They are fitted up with boilers, but have no other means of cooking. A ventilated roasting oven should be put up in each cook-house. The cook-house at the end of the cavalry barracks should have a shaft through the ceiling, and perforated panes in the windows for ventilation.

A simple plan has been proposed by Colonel McMurdo for varying the cooking by stewing on a hot plate. We have authorized his making the trial, though of course this will not supersede the necessity of roasting ovens.

There is no covered drill-shed belonging to either barrack.

There are the usual workshops attached to each barrack, but the infantry tailors' shop, being too small, has been given up to a married non-commissioned officer, and an infantry soldiers' barrack-room has been misappropriated for a tailors' workshop.

Water for the barracks is derived from six tanks with filters attached to them, and six wells. Part of the roof water is also collected for use. The wells are very deep, and expend a large amount of labour in pumping. We are informed that horse-power is

about to be applied to this operation. If the whole roof water were collected, it would materially augment the disposable supply.

The barracks are drained by a sewer passing down the centre of the barrack square, and receiving smaller branch drains, the drainage being discharged on an adjoining field below the level of the barracks.

The fall is ample, and the drains are all reported effective, and properly trapped. Connected with one of these drains, behind the infantry barrack, are the privies of the range. The soil is received into the drain, and is flushed down the drain, and out of the barrack into a tank about 50 yards outside the boundary wall. The arrangement is a considerable improvement over the usual form of privy, but in this, as in all cases, no such expedients can compensate for the absence of water receptacles. We would recommend that these privies be reconstructed as water latrines, in which water shall stand between the times of flushing. All the other privies are connected with cesspits periodically emptied. These should be abolished, and water latrines, with divisions of seats, half-doors, light, and ventilation, should be provided for the whole barrack. All urinals should also be supplied with water.

We are informed that Mr. Herapath's deodorizing system by magnesian lime is about to be applied to the sewage.

Ventilation has been provided for in the construction of the cavalry stables. It is obtained by bringing in air through channels in the division walls, and admitting it under each manger. An outlet 9 inches by 6 is also provided for each stable. It is carried up in the chimney, and has openings over each stall. This outlet has not sufficient area to ventilate the stables, and prevent risk of the fumes passing into the rooms above, through the ceilings. We are of opinion that to do this properly it will be needful to carry up a shaft from each corner to above the roof of the buildings. The shaft should be lined with soldered zinc.

The provost cells are clean and well ventilated. There is an offensive privy and cesspit belonging to them, which ought to be abolished.

Ventilation is required in the guard-room by a shaft and inlet, and the grate should be remodelled to save heat.

The adjoining lock-up is very small and unhealthy. Another ought to be constructed with as little delay as possible.

There are no married quarters in these barracks. The want leads to misappropriation of barrack-rooms; and proper accommodation for married non-commissioned officers and soldiers is much required.

*The following are the Sanitary Improvements necessary for Horfield Barracks:—*

1. Reduction of numbers in the barrack-rooms of both cavalry and infantry barracks to the extent stated.

2. Ventilation of all the barrack-rooms by shafts and inlets, as described. Ventilation of the non-commissioned officers' rooms by silk flap ventilators in the chimneys. Ventilation of the staircases by perforated glass panes in the windows. Ventilation of the guard-room by a shaft and inlets. Ventilation of the library and reading-room by a shaft and inlets.

3. Ablution-houses to have a bead to the ablution tables; to have pegs and gratings, and additional ventilation by perforated panes in the windows. Baths, with water laid on, to be provided in the proportion of one bath to 100 men.

4. A laundry and drying stove to be provided for the women's wash-houses. Infantry wash-house to have additional light through the roof, and the cavalry wash-house to have a louvre in the roof for ventilation.

5. Cook-houses to be supplied with ventilated roasting ovens. Cavalry cook-house to be ventilated by a shaft and perforated panes.

6. All cesspits within the barrack enclosure to be abolished, and all the privies to be converted into water latrines, with divisions of seats, half-doors, light, and ventilation. Urinals to be supplied with water for cleansing.

7. The doors between the stables and the staircases in the cavalry barracks to be built up, and the stables to be ventilated by shafts carried from the corners to above the roof.

8. Barrack-room walls to be quicklime washed at the customary intervals of time, and only scraped occasionally.

*Horfield Barrack Hospital.*

This building is situated at the upper end of the barrack enclosure. It is two stories high, and contains seven wards, arranged somewhat peculiarly.

There is a wide passage and staircase, which traverses the building from front to back, and at right angles to this are two passages, right and left, on each story. The passages on the lower floor give admission to the kitchen, surgery, &c., and on the upper floor they give access to the wards. At the far end of each passage is a long ward running from the back to the front of the building, having two windows at each of the two opposite ends. Opening right and left from the passage are five small wards, with windows only on one side, so that the passage forms a sort of inner corridor connecting the wards, and without any direct light or ventilation. The whole hospital at the time we saw it was admirably clean.

The following table shows the ward accommodation in comparison with what it would be at 1,200 cubic feet per bed:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 4 | 3 | 1 |
| 2 | 12 | 7 | 5 |
| 3 | 4 | 3 | 1 |
| 4 | 1 | 1 | — |
| 5 | 4 | 3 | 1 |
| 6 | 12 | 7 | 5 |
| 7 | 4 | 3 | 1 |
| Total - | 41 | 27 | 14 |

Several of the wards are so small that it is impracticable to give 1,200 cubic feet per bed, without leaving a very large remainder. We have, therefore, preferred leaving the additional bed in the ward to taking it out. In every ward, therefore, except No. 4, the amount of space we have allotted in the preceding table falls considerably short of 1,200 cubic feet per bed, and withal the present wards can only accommodate 27 beds. The wards are ventilated at present by Moore's louvred panes in the windows, but the number is quite insufficient, for although only about half the beds were occupied at the time of our inspection, the ward atmosphere was in an offensive state.

To remedy this we would propose to carry up one shaft from the ceiling of each ward to above the roof of the building, and to leave the present louvres as inlets. It will be necessary also to ventilate each passage by carrying a shaft from its ceiling near the door of the end ward to above the roof. Perforated panes should also be introduced into the stair windows. When this is done, a swing window placed over the door of each end ward will assist in improving the thorough ventilation of the building.

The wards are lighted by candles, ten candles per week being allowed for each ward. The light is described as very insufficient. If gas be brought to the barrack, it should certainly be introduced into the hospital, with a ventilating funnel and tube over each jet.

There is an ablution-room, but it has no proper fittings. It should have a slate table, with sunk basins, and hot and cold water laid on.

The bathing accommodation consists of an unnecessarily large iron bath and a shower bath. There is a copper and furnace, but no water is laid on, and every drop of water for the bath has to be carried from the pumps in the barrack square. A proper fixed bath should be provided, with hot and cold water laid on.

The hospital wash-house has tubs, but it has no drying stove, and no water laid on.

The arrangements for cooking are sufficient, but as the kitchen is under a ward, it requires a shaft carried up through the roof, and perforated panes for ventilation.

Water is not laid on at any part of the hospital, which is a great defect, and one requiring remedy.

There is no water-closet attached to the hospital ; there are three flushed privies in the back yards. These should be converted into proper water latrines, and a water-closet should be built behind the hospital, with an entrance from the staircase.

The pack store is described as being very damp, and quite unfit for keeping packs.

Probably a small stove placed in it would remedy this defect.

There is no accommodation for the sick of soldiers' families.

Behind the hospital is a deep undrained ash-pit, in a position where refuse ought not to be accumulated. This ash-pit should be done away with, and the hospital refuse removed to a greater distance.

*The following, then, are the Sanitary Improvements required:—*

1. Reducing the number of beds in each ward to the extent stated.

2. Ventilating each ward by a shaft from the ceiling to above the roof. Ventilating each passage by a shaft, and by perforated panes in the stair windows, and by placing a swing window over the door of each end ward. Ventilating the kitchen by a shaft and perforated panes.

3. Providing a proper fixed bath and ablution basins, with hot and cold water laid on.

4. To provide a water-closet entering from the staircase, and to substitute a proper water latrine for the existing flushed privies in the yard. Ash-pit to be abolished, and the hospital refuse to be collected and removed daily in an iron barrow or otherwise.

5. Laying on water, and providing a drying and laundry stove for the wash-house.

Sidney Herbert.
John Sutherland.
W. H. Burrell.
Douglas Galton.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, February* 19, 1859.

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## PLYMOUTH AND DEVONPORT.

Sir,

In conformity with our instructions we have inspected and made inquiry into the sanitary state of the following barracks and hospitals at Plymouth and Devonport, and we have now the honour to transmit to you our report respecting them.

The barracks and hospitals we have inspected in this district are as follows :—

Plymouth - 1. The Citadel.
2. Prince of Wales redoubt.
3. Maker barracks.
4. No. 6 redoubt.
5. Picklecombe Point.
6. St. Nicholas Island.

Devonport - 7. Raglan barracks (and married quarters).
8. New Artillery barracks.
9. Granby Infantry barracks.
10. Mount Wise barracks.
11. Bull Point barracks.
12. General hospital.

### 1. The Citadel.

The citadel is built on an angle of land projecting into Plymouth harbour. It covers about eight acres of ground, is considerably elevated above the water, and freely exposed to the sea breezes. The subsoil is rocky, and the natural facilities for drainage amply sufficient. The site is healthy, and well ventilated. Part of the buildings date as far back as 1670, but some are of more modern construction.

The officers' quarters are in a long two-story range of small low ceiled rooms, in many points affording very inadequate accommodation, and which would require reconstruction to make them what they ought to be.

The men's barrack accommodation consists of casemates, barrack-rooms, which have been formed out of an old store, called "The large barrack," and three ranges of buildings, known as the "Chaplain's range," "The fort-major's range," and "The governor's range." The casemates are immediately within the curtains, and the barrack ranges are built parallel to the curtains. The total accommodation within the citadel, according to present regulation, is for 1,180 non-commissioned officers and men.

The casemated barracks are of defective construction as regards health, and are in this respect far behind the new casemates in Dover citadel. They are low, dark, and not sufficiently ventilated. Most of them are between eight and nine feet high from the floor to the crown of the arch. The floors are covered with asphalt, a bad material for such a purpose. It is cold, never looks clean, and is very liable to have damp deposited on it. The floors should be boarded when repairs are next required. Each casemate has a door, and two windows at one end only. They have each one fireplace, and a shaft for ventilation carried up from the top of the end wall to the parapet above, where it is covered by a grating, but there are no inlets for air. The windows and doors of the casemates are arched inside, and square headed outside ; some additional light might be obtained by opening out the portion between the square head and the circular top, and filling the space with glass. The ventilation admits of easy improvement, by inserting a silk flap ventilator into the chimney of each casemate, as near the crown of the arch as possible. An inlet for fresh air ought to be at the same time provided, by making an opening through the wall over the door close to the top of the arch, and by providing a cornice of perforated zinc inside for diffusing the admitted air.

The rooms in the "large barrack" are constructed back to back, with two windows on one side and a dead wall on the opposite side. There are louvred openings through this wall, but they are of no use for ventilation. The rooms enter from each side of a staircase, passing right through the building. In the upper floors a serjeants' room is partitioned off from the staircase.

The rooms in "The large barrack" are tolerably good, but they require ventilation. For this purpose a shaft will have to be carried up from the ceiling of each room to above the roof, and two inlets for air, of the usual construction, will have to be made in the outer wall.

The staircase also requires ventilation by perforated panes of glass in the top sashes of the windows. Each serjeants' room should have a silk flap ventilator in the chimney close to the ceiling.

The rooms in "The chaplain's range" and "fort-major's range" are built back to back. They have windows on one side only, and a louvred opening

through the wall between the adjoining rooms. They have no means of ventilation. The rooms are not good —some of them are better than others, but there are rooms in the basement of the chaplain's range which are not fit for occupation, and which ought to be struck off the construction. All the other rooms ought to have shafts and inlets for ventilation. It was stated to us that it is under consideration to rebuild these ranges ; a very desirable measure, in our opinion, so far as concerns the health of the men.

The rooms in "The governor's range" are entered from a wide central staircase, out of which, on each flat, enters a large barrack-room to the front and two small ones at the sides. The upper rooms have no ceilings. All of these rooms require shafts and inlets for ventilation, and the staircase requires ventilation by perforated glass panes in the windows.

In all the barrack-rooms and casemates, with two or three exceptions, the amount of cubic space is considerably below what is required for health. The deficiency is shown in the following table, which exhibits the accommodation under existing regulation as contrasted with the amount available at 600 cubic feet per man :—

| Barrack Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| Casemates :— | | | | | |
| Nos. 1, 2, 3 | 27 | 12 | 15 | 9 | 4 |
| No. 4 - | 12 | 8 | 4 | 12 | 8 |
| No. 5 - | 13 | 8 | 5 | 13 | 8 |
| No. 6 - | 10 | 5 | 5 | 10 | 5 |
| Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 | 90 | 50 | 40 | 9 | 5 |
| Nos. 17, 18, 19 | 27 | 18 | 9 | 9 | 6 |
| Nos. 24, 25 | 18 | 12 | 6 | 9 | 6 |
| No. 26 - | 15 | 10 | 5 | 15 | 10 |
| No. 27 - | 9 | 6 | 3 | 9 | 6 |
| No. 28 - | 9 | 5 | 4 | 9 | 5 |
| No. 29 - | 14 | 10 | 4 | 14 | 10 |
| Nos. 30, 31, 32, 33, 34, 35 - | 54 | 30 | 24 | 9 | 5 |
| Large Barrack :— | | | | | |
| Nos. 106, 107, 108, 109 - | 80 | 52 | 28 | 20 | 13 |
| Nos. 111, 112 - | 40 | 22 | 18 | 20 | 11 |
| Nos. 114 115 - | 40 | 26 | 14 | 20 | 13 |
| Nos. 117, 118 - | 40 | 24 | 16 | 20 | 12 |
| Nos. 120, 121 - | 40 | 22 | 18 | 20 | 11 |
| Chaplain's Range :— | | | | | |
| No. 23 - | 10 | 7 | 3 | 10 | 7 |
| Nos. 24, 27, 28, 33, 37, 42, 43, 46 - | 96 | 56 | 40 | 12 | 7 |
| No. 34 - | 10 | 7 | 3 | 10 | 7 |
| Nos. 25, 26, 29, 30, 31, 32, 38, 39, 40, 41, 44, 45 - | 144 | 72 | 72 | 12 | 6 |
| Nos. 48, 49, 50 | 9 | 6 | 3 | 3 | 2 |
| Nos. 51, 53 | 6 | 6 | 0 | 3 | 3 |
| No. 52 - | 3 | 2 | 1 | 3 | 2 |
| Fort-Major's Range :— | | | | | |
| Nos. 56, 57 | 10 | 6 | 4 | 5 | 3 |
| No. 58 - | 12 | 7 | 5 | 12 | 7 |
| No. 59 - | 12 | 6 | 6 | 12 | 6 |
| Nos. 61, 64, 67, 70 - | 48 | 24 | 24 | 12 | 6 |
| Nos. 62, 63, 68, 69, 71, 72 - | 72 | 42 | 30 | 12 | 7 |
| No. 73 - | 5 | 3 | 2 | 5 | 3 |
| Nos. 83, 84, 85, 86 - | 10 | 10 | 0 | — | — |
| Governor's Range :— | | | | | |
| No. 89 - | 6 | 4 | 2 | 6 | 4 |
| No. 91 - | 6 | 4 | 2 | 6 | 4 |
| No. 93 - | 28 | 19 | 9 | 28 | 19 |
| No. 94 - | 12 | 11 | 1 | 12 | 11 |
| No. 95 - | 6 | 4 | 2 | 6 | 4 |
| No. 96 - | 28 | 22 | 6 | 28 | 22 |
| No. 97 - | 12 | 7 | 5 | 12 | 7 |
| Total - | 1,083 | 645 | 438 | — | — |

The deficiency of accommodation amounts to 40 per cent. There is room for no more than 645 men, instead of 1,083, the number on the present construction of the barracks.

To do away with this overcrowding, the basement rooms under the chaplain's range ought to be evacuated at once, and the necessary reductions made in the other barrack-rooms as soon as practicable.

The fire-grates in the barracks and casemates are of the old construction, and might be remodelled with advantage, to save heat.

All the barrack-rooms are lighted by candles. The canteen alone has gas, which was brought in at the expense of the canteen man. The gas costs 4*s*. per 1,000 cubic feet.

The barrack-rooms, casemates, school-rooms, and reading rooms ought to have ventilated gas-burners introduced into them.

There are no day-rooms, cleaning-rooms, or covered drill sheds.

There is one large school-room for 80 scholars. It is situated in the governor's range ; its ceiling is low, and there are windows only on one side. It requires ventilation by shafts and inlets, with perforated zinc cornices.

The girls' and infants' school-rooms are very small and crowded. They should be ventilated by shafts and inlets of the usual construction. The library also requires ventilation in a similar manner.

There are several ablution houses in different parts of the barracks. One, belonging to the casemates, is very small and narrow ; it has no pegs, and it would be somewhat improved by ventilation through the roof, The ablution house at the chaplain's range also requires ventilation and pegs. Similar improvements are needed for the ablution house in the governor's range.

Ventilation in both cases could be supplied by glass louvres in the windows.

There are no baths. A bath house, with one bath for every 100 men, should be erected in some convenient locality, and have water laid on.

There is no proper laundry. There is one good wash-house with boilers, but it has no fixed tubs and no drying stove. At the end of the chaplain's range in the basement is situated a gloomy unventilated wash-house, almost entirely below the level of the

ground. It has no fixed tubs, and no means of drying or getting up linen. It requires ventilation by a shaft 18 inches square, carried up from the ceiling to above the roof, and by perforated glass panes in the windows. This wash-house admits of very little improvement, but the one behind the "large barrack" has space in which a drying closet might be placed, where all the soldiers' linen could be dried. Both wash-houses should have fixed tubs and water laid on.

There are three cook-houses situated in the basement of the barrack ranges. They are dark and insufficiently ventilated, and have no roasting ovens. Each of them requires a shaft, at least one foot square per six boilers, carried up to above the roof of the barrack ranges, and perforated glass panes in the windows. There is one good cook-house behind the "large barrack." It has boilers, but no other means of cooking. All these kitchens require roasting ovens.

The only accommodation for pursuing trades consists of a tailor's and shoemaker's shop, besides the armourer's shop. All need ventilation through the roof by shafts and inlets for air.

The staff serjeant's quarters are unventilated. They require a silk flap ventilator into each chimney.

The guard-room requires inlets for air, and a silk flap ventilator into the chimney.

Water is supplied to the citadel from the mains of the Plymouth Water Company, but it is stated to be insufficient in amount, though the quantity might be increased by enlarging the main. The water from the roofs is also collected for use.

All the buildings are drained by earthenware pipes to the sea. The drains are stated to be all trapped, and none of them pass under any buildings.

There are several ash-pits behind the barrack ranges, which could be very easily dispensed with by simply removing the front wall, and placing an iron cart to receive the ashes, and in which they might be removed daily. This we recommend to be done.

The privies are in the curtains. They are drained to the sea, and have an apparatus for cleansing, which throws numerous jets of water over the floor and seats, but does not properly flush the troughs, and there is consequently considerable nuisance from them, which might be avoided by better arrangements.

Proper water latrines are required, with proper means of flushing, better ventilation, and divisions between the seats, and half-doors.

There are no married quarters in the citadel, and married people have to be accommodated in casemates or barrack-rooms. The casemates so occupied at the time of our inspection were crowded with women and children, and almost the whole floor space was covered with beds placed close to each other.

The canteen tap-rooms require silk flap ventilators into the chimneys, and perforated glass panes in the windows.

*We would recommend the following Improvements to be carried out in these Barracks:—*

1. The number of men in each casemate and barrack-room to be reduced to the extent stated, and the rooms in the basement of "the chaplain's range" to be evacuated and struck off the barrack-room construction.

2. Each casemate to have a silk flap ventilator placed in the chimney, and an inlet for air over the door. The inlet to be covered by a perforated zinc cornice for diffusing the air within the casemate.

The window space of all the casemates to be enlarged in the manner pointed out.

The floors to be boarded at the earliest opportunity.

3. Each barrack-room to be ventilated by one or by two shafts as the case may be, to afford the requisite sectional area per man, and each room to have two inlets for air covered by perforated zinc cornices close to the ceiling. All the staircases to be ventilated by perforated glass panes in the upper sash of each window.

The non-commissioned officers' rooms to be ventilated by silk flap ventilators into the chimneys.

The guard-room to be ventilated by inlets for air, and by a silk flap ventilator into the chimney.

The school-rooms and library to be ventilated by shafts and inlets.

The workshops to be ventilated by shafts and inlets.

The canteen rooms to be ventilated by silk flap ventilators, and by perforated panes in the windows.

All the barrack-room and casemate fire-grates to be remodelled, to save heat.

4. The casemates, barrack-rooms, library, and adult school-room to have ventilated gas-burners, and the gas-burners in the canteen tap-rooms to be ventilated.

5. Ablution houses to be ventilated, and to have pegs, as stated.

6. A bath house, with one bath for every 100 men, and water laid on, to be provided.

7. Wash-houses to be ventilated as described, and to have fixed tubs, and means of drying and getting up linen.

8. Cook-houses to be provided with ventilated roasting ovens. The cook-houses in the basement of the barrack ranges to be ventilated as described.

9. Ash-pits to be removed, and iron carts substituted.

10. The privies to he converted into water latrines, with divisions of seats and half-doors, and to have more ventilation.

Lastly, married quarters, day-rooms, and a drill shed are required.

*Citadel Temporary Hospital.*

The Hospital accommodation in the citadel consists of two small rooms, in one of which two sick are accommodated, and in the other three sick. They are intended merely as places to which a slight case or two of disease may be sent before being transferred to the general hospital at Devonport. The accommodation is otherwise quite unsuited for a hospital.

*We would recommend:—*

That the rooms be provided with a shaft and inlet each for ventilation.

2. The Prince of Wales Redoubt.

This is a small fort covering about half an acre of ground, in an isolated position, about 200 yards from the water in Plymouth Sound. It was erected in 1850, and has regulation accommodation for three officers and 76 men, including one serjeant and three servants. The men are barracked in four casemates, each 31 feet long, 20 feet 4 inches wide, and 13 feet 6 inches high. They open on a small inner court-yard, from which they are lighted by windows and doors. The casemates are of a very good height; they have air shafts and inlets, but the latter require perforated zinc covers of the usual construction, to prevent draughts. At present the men keep the covers of the inlets closed. These inlets are placed close to the outlet shafts instead of being at the opposite end of the casemate over the door, where they ought to have been. The casemates are otherwise very good.

The regulation number of men gives 472 cubic feet per man. The following is the accommodation:

| Rooms. | Total present Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 4 | 72 | 56 | 16 |

By reducing the inmates of each casemate from 18 to 14, each man of the remaining number would have as near as possible 600 cubic feet.

It is unfortunate that a better serjeant's room was not provided. The present one is off the kitchen, and very unsuitable. The kitchen, guard-room, and ablution-room are all gloomy.

The kitchen has no means of cooking, except boilers. A roasting oven is required.

Close to the kitchen is an ash-pit, situated on one side of the close inner court of the redoubt. It occupies space where space is needed, and it is better not to accumulate putrescent refuse in such localities; besides which it is quite unnecessary to do so. The whole kitchen refuse ought to be collected and removed out of the fort daily.

The privies are very defective in construction, and very offensive. They empty themselves into the sea, but are not supplied with water. They require to be reconstructed as water latrines. Macfarlane's apparatus would answer every purpose efficiently.

The drains are not trapped.

Water is derived from tanks within and without the fort, and the supply is stated to be sufficient.

*We would recommend for this Redoubt as follows:—*

1. Providing diffusers for the admitted air in the casemates.
2. A roasting oven to be supplied for the kitchen.
3. Re-construction of the privies as water latrines, with divisions of seats and half-doors.
4. Trapping all the drains.
5. Doing away with the ash-pit, and collecting and removing the refuse daily.

Lastly. At all ordinary times we are of opinion that the casemates ought to have no more than 14 men in each.

### 3. Maker Barrack.

This barrack is situated in an elevated and completely isolated position, overlooking the sea, about three miles south-west of Plymouth. It consists of a single range of two-story buildings erected across the gorge of an earthen redoubt. The officers' rooms are at one end of the building. The usual outhouses are separated from the barracks by a narrow court behind. The buildings face the south, and their local position is healthy.

Within the enclosure there is an area of about an acre in extent, having a rocky sub-soil. The structures are of stone and wood, and were undergoing repair and extension at the time of our visit.

There are in all two serjeants' rooms and nine men's rooms, with a total accommodation for 171 non-commissioned officers and men. The following table gives the details —

| Rooms. | Total Present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| No. 1, Lower - | 18 | 14 | 4 |
| „ 1, Upper - | 22 | 20 | 2 |
| „ 2, Lower - | 18 | 12 | 6 |
| „ 2, Upper - | 22 | 20 | 2 |
| „ 3, Lower - | 18 | 12 | 6 |
| „ 3, Upper - | 22 | 20 | 2 |
| „ 4, Lower - | 18 | 12 | 6 |
| „ 4, Upper - | 22 | 20 | 2 |
| „ 5 - - | 6 | 5 | 1 |
| Total - | 166 | 135 | 31 |

All the lower rooms are considerably over-crowded, according to the Schedule, and the largest proportion of men requires to be removed out of them.

In recommending the reductions in the preceding table, we have given considerably less than 600 cubic feet per man to the remaining inmates of the rooms, being guided in this, as in other similar cases, by the form of construction, and by the elevated, airy position of the barrack, as well as by its comparatively small number of inmates. It is necessary to state that our calculations as to the accommodation are based on returns sent us by the barrack master before the recent alterations were carried out. These alterations we saw in progress, and the improvements we are about to recommend have reference to the state of the barracks as we saw them.

For instance, no provision was being made for ventilating any of the barrack-rooms. To remedy this, we think it necessary that a ventilating shaft be carried up from the ceiling of each of the ground-floor rooms to above the roof, and that each room should have two inlets for air, with perforated zinc diffusing cornices of the usual construction. One of the inlets should be placed on each side of the room.

The upper rooms have no ceiling, but are carried up into the slope of the roof. In all these upper rooms we would recommend a louvred turret to be placed over the middle of the ridge, and two inlets for air, one on each side the room, to be provided close to the eaves.

The small six-men room will be sufficiently ventilated by a silk flap ventilator into the chimney, and by an inlet for air. Each of the serjeants' rooms requires a silk flap ventilator into the chimney; and the guard-room should have a similar ventilator and one inlet for air.

The fire-grates are of the old pattern, and might be remodelled with advantage.

The barrack is lighted with candles, and gas cannot be obtained.

There is no day-room, school-room, library, cleaning-room, drill shed, nor workshop. There is no place for married soldiers, except in the barrack-rooms.

The ablution room is dark. It is situated in a defensible tower at one corner of the barrack enclosure. It should have more light, if possible. One bath, with water laid on, is required.

The women's wash-house is very small. It is a mere shed, without any conveniences for washing. It requires a boiler, fixed tubs, and a drying stove. It should, in fact, be re-constructed and properly ventilated, and made fit for its purpose.

There is a cook-house in an old wooden building, with boilers set round a central shaft. It has no other means of cooking except boiling. The building requires re-construction in a more durable form, but in the mean time a ventilated roasting oven should be erected in it.

Water is derived from a well, and from the roof-water. It is stated to be insufficient in amount, but no doubt the supply admits of extension.

The barrack drainage is defective; and the drains, such as they are, are untrapped.

There is a very offensive privy connected with a drain, which conveys the fluid portion down the steep hill side, where it is utilized by farmers. The privy is only washed out ocasionally. We would propose that one of Macfarlane's water latrines be put up, in this instance, in lieu of the privy. It requires only a small quantity of water to keep it clean. It should have divisions of seats, and, if possible, half-doors. The outlet for the sewage already exists in this case. All the gulley grates should be trapped.

Close to the barrack is placed a large ash-pit for receiving and accumulating the barrack refuse. It should be removed, and the refuse taken to a short distance outside the works. It is quite unnecessary to have an ash-pit in such a situation.

There are several redoubts in the neighbourhood where Maker barrack is situated; and if they were all occupied there would be a considerable number of men living at a distance from any market. A canteen would, therefore, be a great convenience.

*The following are the Sanitary Improvements required in Maker Barrack:—*

1. Reduction of numbers as stated.
2. Ventilation of all the barrack-rooms, sergeants'

rooms, and guard-room, in the manner described, and re-modelling the firegrates.

3. One bath, with water laid on, to be provided.

4. Women's wash-house to be re-constructed, with boiler, tubs, drying stove, &c.

5. A roasting-oven to be provided for the cook-house.

6. Privies to be re-constructed, with a Macfarlane's latrine, and with divisions of seats, and half-doors. Gulley grates to be trapped.

7. Ash-pits to be done away with, and the barrack refuse removed daily out of the enclosure.

### 4. No. 6 Redoubt.

This is a purely defensive fort, with accommodation for 31 men. It is situated on the slope of the hill towards the sea, at a short distance below Maker barrack.

There are three barrack-rooms, one for 20 men and two for five men each. They are long, narrow, lofty, casemated rooms, closing the gorge of the redoubt. They have loopholes to the rear, and low windows towards the interior of the work. A portion of one of the third and lowest rooms has no windows, and the rooms are generally dark. All the rooms are defectively ventilated. To remedy this, the windows should be increased in height, and a large silk flap ventilator should be placed in each chimney. An inlet for air should also be made in the upper part of the end wall of the two rooms near the gate, at a distance from the chimney. The third and largest room is more difficult to ventilate, and it is the one which requires it most.

Besides a large silk flap ventilator for the chimney, two inlets for air, with perforated zinc cornices for diffusing the current, should be made as high up in the walls as possible.

The ablution-room requires a proper ablution table, with a bead along the edge, also gratings and pegs.

The cook-house has boilers, but no other means of cooking. It requires an oven, capable of roasting and baking meat.

The privy does not hold water. The fall for drainage from it is very steep. A water latrine, on Macfarlane's principle, should be substituted for the present arrangements, and the urinal should also be supplied with water.

The ash-pit is close to the cook-house. It would be very desirable in so confined an area, were it possible, to provide for the refuse being placed in a receptacle outside the enclosure.

The guard-room has loopholes along one wall, a window in another wall, a door opposite the loopholes, and an old pattern grate in the corner. The numerous openings would probably afford sufficient ventilation.

As this redoubt is intended simply for defensive purposes, and must contain its complement of men, it is not necessary to recommend any reduction of numbers. We have elsewhere expressed an opinion that casemates generally are not places in which soldiers should be barracked at ordinary times.

*We would simply recommend as follows :—*

1. That each casemate be ventilated by a large silk flap ventilator in the chimney. That each of the smaller casemates have one inlet for air, and the larger one two inlets.

2. That the ablution house be supplied with an ablution table.

3. That a roasting oven be put up in the kitchen.

4. That a Macfarlane's water latrine be substituted for the present privy, and the urinal be supplied with water.

5. That the ash-pit be removed outside the enclosure.

#### *Hospital.*

The hospital is a detached structure, in a lofty isolated airy situation, between Maker barrack and No. 6 redoubt, and is intended for the temporary reception of cases of illness occurring in these barracks.

It is built of wood, covered with slate externally, on a brick foundation, and consists of an E-shaped building, of which the wings are formed by two good wards connected by a passage, out of which open the surgery, orderlies' room, and kitchen.

The wards are of a tolerable size and have large windows. They have some ventilation in the ceiling, which might be easily rendered sufficient by a silk flap ventilator into the chimney. The fire-grates are of the old pattern, and should be remodelled. Each ward has regulation space for 12 beds, where hardly half that number ought to be. Certainly not more than seven beds ought to be allowed to each ward, and we would propose to reduce the accommodation to that extent, and to remove 10 beds out of the building.

The passage requires ventilation by perforated panes in the doors, and by a shaft, one foot square, carried through the roof.

The kitchen should have perforated panes in the upper sashes of the window.

Water is obtained from a spring at hand, and is laid on to the kitchen.

There is no water-closet, but there is a privy with cesspit in the back yard. The cesspit should be abolished, and the privy converted into a water-closet, and connected by a covered passage with the hospital, or a proper building for a water-closet should be erected.

Considering the temporary character of the building, we do not think it necessary to advise that much money should be expended on its improvement.

*We shall therefore limit our Recommendations to the following essential Points :—*

1. Reduction of the number of beds from 12 to 7 in each ward.

2. Ventilation of the wards, by a silk flap ventilator into the chimney. Ventilation of the kitchen by perforated panes, and ventilation of the passage by a shaft and perforated panes.

3. Providing a water-closet and abolishing the cesspit.

### 5. Picklecombe Fort.

This barrack and fort are situated on the western side of the entrance to Plymouth Sound, at a slight elevation above the sea. The area within the enclosure is about a third of an acre in extent, and the ground slopes rapidly from the hill behind to the fort, and from the latter to the sea. The barracks are built on a terrace above and behind the battery. They are two stories high, with a tower at each end. The lower story contains the ablution-rooms, kitchen, stores, &c., and the men's rooms are situated in the story above and in the eastern tower. The officers, quarters are in the western tower.

The barrack accommodation consists of nine soldiers' rooms, four of which are in the tower, and five are in the body of the buildings. The latter consist of casemated rooms, four of which are 36 feet long, and one, used as a barrack-serjeant's store, is 69 feet in length. The total accommodation is for 96 men, and the details are given in the following table :—

| Rooms. | Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 14 | 10 | 4 |
| 2 | 16 | 12 | 4 |
| 3 | 15 | 12 | 3 |
| 4 | 16 | 13 | 3 |
| 5 | 20 | 17 | 3 |
| 6 | 4 | 4 | — |
| 7 | 4 | 4 | — |
| 8 | 4 | 4 | — |
| 9 | 3 | 3 | — |
| | 96 | 79 | 17 |

Taking into account the isolated position of this barrack we do not consider it necessary to give 600 cubic feet per man, and the amount of healthy accommodation in the table, namely, that for 79 men, is calculated below 600 cubic feet per man.

To enable this to be done, however, the rooms must be well ventilated, no provision for which at present exists, although provision could have been easily made in the construction.

We would propose to remedy the defect as far as possible by placing large silk flap ventilators in each chimney, and by contracting the fireplace below by remodelled grates, to increase the draught through the ventilators; air should, at the same time, be admitted through the loopholes in rear (which have double windows) by putting a perforated pane in each sash in every third loophole.

The turret barrack room should have a perforated pane as near as possible to the top of each window, and a silk flap ventilator in the chimney.

The long barrack-room, in addition to the ventilators in the chimney, will require a hollow beam with a wooden bottom, perforated zinc sides, and a division across the middle, to be carried through the outer walls, and across the middle of the room at the ceiling, to communicate with the air on both sides, the sectional area of the beam being about 12 square inches per man.

Water is derived from the hill behind the fort, and is received into a tank capable of holding 3,700 gallons. The well holds 1,800 gallons. The supply is stated to be deficient in September and October. It is worthy of consideration how far this could be remedied by making a tank (to be filled at other times of the year) capable of containing sufficient water for the dry season.

The privy is situated in an angle of the platform. It is dark and unventilated, and requires light and ventilation through the roof, divisions of seats, and half-doors. At present it is drained to the sea, but is not supplied with water. It should be converted into a water latrine.

The cook-house is under the barrack-rooms. It should have a shaft carried up to above the roof, if there is space for such a shaft in the tower containing the chimneys, and perforated panes should be placed in the windows. At present the only means of cooking are boilers of the usual form. An oven capable of roasting and baking meat is required.

The ablution-room should be ventilated by perforated panes in the window. Pegs, and a bead to the table are also needed.

There is no bath. One is required, with water laid on.

These barracks were built in 1848, but they were not occupied at the time we inspected them. They are unprovided with many of the conveniences which would be desirable were they intended for permanent occupation by troops. One point in their structure has been brought under our notice as giving rise to discomfort to the men, namely, that the large barrack-rooms enter the one from the other, and have no separate entrances. Amongst other deficiencies there is no place where linen can be washed.

*The following Sanitary Improvements ought to be carried out in these Barracks :—*

1. The numbers in the rooms at ordinary times should be reduced to the extent stated.
2. All the rooms to be ventilated as recommended.
3. The privy to be converted into a water latrine, with divisions of seats, half-doors, light, and ventilation.
4. Ablution house to have pegs, and one bath, with water laid on.
5. Cook-house to be ventilated, and provided with a roasting oven.

### 6. St. Nicholas Island Barracks.

St. Nicholas Island lies in Plymouth Sound. The fort on it contains barracks for 130 men.

The barrack enclosure is about an acre in area. The buildings are old, and by no means well adapted for their present purpose.

The rooms are built back to back, and are entered by a passage through the building, from which a staircase leads to the upper floor.

Each room has only one window, and the fireplace, with a grate of the old pattern, is opposite the door.

The back rooms are very dark, and external circulation of air is much interfered with by the too close proximity of buildings in the rear.

The deficiency of light should be remedied as far as practicable by opening additional windows in the end rooms, while all the other windows should if possible be enlarged.

The rooms are very much overcrowded, and we are of opinion that, taking into consideration the defective construction of the barrack buildings, 600 cubic feet should as nearly as possible be allotted to each inmate, notwithstanding the apparent favourable position of the fort for health.

The following table shows the accommodation as it is and as it ought to be :—

| Rooms. | Present Regulation Number of Men. | Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 8 | 5 | 3 |
| 2 | 8 | 5 | 3 |
| 3 | 9 | 6 | 3 |
| 4 | 8 | 4 | 4 |
| 5 | 8 | 5 | 3 |
| 6 | 8 | 5 | 3 |
| 7 | 8 | 5 | 3 |
| 8 | 8 | 5 | 3 |
| 9 | 8 | 4 | 4 |
| 10 | 8 | 4 | 4 |
| 11 | 8 | 4 | 4 |
| 12 | 8 | 4 | 4 |
| 13 | 8 | 4 | 4 |
| 14 | 8 | 5 | 3 |
| 15 | 8 | 4 | 4 |
| 16 | 9 | 6 | 3 |
| Total - | 130 | 75 | 55 |

The rooms will not divide equally into cubic spaces of 600 feet; we have given rather less than that amount, and find that 75 men is the maximum number the rooms ought to contain.

Notwithstanding the overcrowding shown in the above table none of the rooms are ventilated. To remedy this defect each room should have a shaft carried up from the ceiling to above the roof close to the back wall, and an inlet for air over the window.

The passages should also be ventilated by a shaft through the ceiling, and by perforated panes in the upper sash of the back window, and of the window over the door. By adopting these means a circulation of air will be provided for throughout the building.

The master gunner's quarter is under the tap room of the canteen and next to the lock-up room. It is small and unventilated, and hardly fit for occupation by such an officer. It would be very desirable to provide him with a proper quarter in a less objectionable situation.

The ablution-room is situated behind the barrack range. It requires pegs, and a bath, with water laid on, if a sufficiency of water can be obtained.

The cook-house is imperfectly ventilated, and it has only boilers for cooking. It should have a louvre in the roof, perforated panes in the windows, and an oven to roast and bake meat.

The urinal and dust heap are in front of the barrack-rooms, but on a lower level; they are complained of as giving rise to nuisance, especially in warm weather. No accumulation of decomposing refuse should be permitted within so limited an area; and besides, it is

not necessary, for refuse could be thrown down a shoot into a covered receptacle near the water's edge, whence it could be removed by the contractor.

There is no day-room nor school-room. There is, however, a library.

There is no women's wash-house, no cleaning-room, nor workshop. There is no separate accommodation or mess-room for non-commissioned officers, and there are no married quarters.

The water supply is defective, and water has to be carried in barrels from the Royal Victualling Yard.

The privies have only three seats. They have no divisions of seats, no light, and no ventilation, and although they are drained they give rise to nuisance. It would be very desirable, provided even waste water could be obtained, to reconstruct them as water latrines, on Macfarlane's principle, with proper divisions of seats, half-doors, and adequate light and ventilation.

The canteen tap-room requires a silk flap ventilator in the chimney.

A proper provision store is also needed for the canteen man, who, for want of a store, has to keep the provisions in his own living room.

It will be seen that the barrack accommodation in Fort St. Nicholas is very imperfect and inconvenient. It is not for us to say to what extent it is possible to increase it. We simply record the facts, and confine ourselves to recommending those sanitary improvements which are necessary and practicable with the existing buildings.

*They are as follow :—*

1. Reduction of numbers of men in the barrack-rooms to give 600 cubic feet each.
2. Ventilation of each barrack-room by a shaft and inlet of the usual form. Ventilation of the passages and staircases by a shaft through the ceiling, and perforated glass panes in the windows. Canteen tap to have a silk flap ventilator in the chimney.
3. The ablution-room to have pegs, and one fixed bath, if water can be obtained.
4. Cook-house to have a roasting oven provided, and to be ventilated by a louvre in the roof and perforated glass panes in the windows.
5. Dust heap to be done away with.
6. Privies to be reconstructed, with water receptacles, divisions, half-doors, light, and ventilation.

*Hospital St. Nicholas Island.*

The hospital consists of one ward up a flight of stairs. It is at present used as a reading-room and school-room.

The surgery is down stairs next to the kitchen.

The accommodation is only of a temporary character, until cases of sickness can be removed to the general hospital. In other respects it is quite unfit for the reception of serious cases of illness. The ward is not ventilated, and should have a shaft and inlet for air, and a remodelled grate. The kitchen should be supplied with a range containing an oven, instead of the ordinary barrack grate at present in use. It also needs ventilation by a shaft through the roof and by a perforated pane in each window.

*The requirements for this Hospital are therefore :—*

1. A shaft and inlet for ventilating the sick ward.
2. A shaft and perforated panes for ventilating the kitchen, and a new cooking range.

### 7. Raglan Barracks.

These are large new barracks, the south wing of which only was completed and occupied at the time of our inspection. They are enclosed within an area of 10A. 3R. 35P., adjoining the town population of Devonport, and near the shores of the Hamoaze.

The buildings are arranged in blocks on three sides of a parallelogram. The officers' quarters are situated at the two ends. The men's quarters are in two blocks, with a detached central building for staff officers' quarters, non-commissioned officers' mess establishment, library, &c., the whole forming a long line of building facing the provost establishment and the main guard. Behind the central line of soldiers' quarters are situated the canteen, cook-houses, privies, urinals, &c.

The buildings are of handsome appearance, and their general arrangement is well adapted for external ventilation and for health ; but, as willpresently be shown, there are defects in the internal construction, some of which admit of removal, and which might be removed with great advantage to the healthiness of the barrack-rooms. The other defects do not admit of remedy.

Each of the barrack-room ranges consists of two slightly projecting wings three stories high, connected by a long central part two stories high, along the face of which an open verandah is carried.

The rooms in the projecting wings differ in construction from those in the centre of the blocks.

The former are entered from the end by spacious stone staircases and landings. Each landing gives access to four rooms, two on each side. These rooms are all within the wings. But there is another room entering from the end of the passage, which is situated in the central portion of the range. One consequence of the form of construction adopted in the wings is, that the rooms are deficient in window space, and that the end nearest the door forms a deep gloomy recess, without sufficient light or means of ventilation.

The rooms vary in dimensions. Eight rooms are 43 feet long, 23 feet 3 inches wide, and 11 feet 6 inches high. Eight rooms are 42 feet 4 inches long, 22 feet 7½ inches wide, and 11 feet 8 inches high. Eight rooms, of the same length and breadth as these last, are 12 feet 6 inches high. Nine rooms are 45 feet 9 inches by 20 feet, and 12 feet high, and other nine rooms are of the same length and breadth, and 12 feet 6 inches high.

For all practical purposes, the length of each room may be taken as indicating the distance between the opposite windows, and the facilities for light and ventilation.

In a number of the rooms there are dark spaces without windows, and in all cases the distance between the windows at the opposite ends of the rooms is about double what it ought to be.

The rooms situated in the two-story central building are reached by broad passages and staircases passing through the ranges, and these rooms have windows at the two opposite ends, back and front. They are consequently better adapted for barrack-rooms than those in the wings, but they resemble corridors ; the distance between the opposite windows being much too great to afford sufficient light to the rooms. The windows are in fact placed at the ends of the rooms instead of along the sides, which latter is the arrangement usually adopted in the best constructed barracks. An additional window should, if possible, be opened in the darkest rooms in the wings.

A serjeant's berth occupies one of the barrack-room windows. On the upper-floor, the end of the passage is occupied by a non-commissioned officers' room, partitioned off from the staircase. These rooms require ventilation by a silk flap ventilator into the chimney.

The roofs are flat, and are covered with asphalt resting on iron plates. Formerly each upper room was open to the roof, but the condensation of moisture on the iron rendered it necessary to add a ceiling perforated with holes. These holes are at present of no use for ventilation, because the roof is air-tight.

None of the barrack-rooms have sufficient means of ventilation, and we were informed that the atmosphere in them at night, especially in the rooms in the wings, is very offensive.

There are Arnott's ventilators in the chimneys, but the opening of the fireplace is too large to enable them to act efficiently ; besides which, their area is much too small to make any material difference in the air of the rooms. Each room will require two foul-air shafts carried from the ceiling above the roof. One of these shafts should be placed in the dark corner of each room in the wings, and the other opposite the side windows. There should be two inlets for air also, covered with perforated zinc cornices made in the walls close to the ceiling of each room.

The two-story barrack-rooms also require two inlets, one at each end, between the windows, and two air shafts on opposite sides of the room towards its middle. The air shafts for the top rooms, with the perforated ceilings, might be simply a louvre of sufficient area carried up through the iron and asphalt roof.

Each staircase requires ventilation by a louvre through the ceiling and roof, and by perforated glass panes in the windows.

The amount of space per man allotted in this barrack is on an average under 500 cubic feet, but the average is an improvement on that hitherto allowed by regulation.

The following table shows what would be the total amount of accommodation at 600 cubic feet per man :—

| Rooms. | Total present Accommodation in Men. | Total Accommodation at 600 Cubic Feet per man. | Deficiency of Accommodation in men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 8 | 184 | 160 | 24 | 23 | 20 |
| 8 | 176 | 136 | 40 | 22 | 17 |
| 8 | 184 | 160 | 24 | 23 | 20 |
| 9 | 207 | 171 | 36 | 23 | 19 |
| 9 | 207 | 171 | 36 | 23 | 19 |
| Total - | 958 | 798 | 160 | — | — |

The excess of men per room over the number which would give somewhat less than 600 cubic feet is as follows :—In the first and third series of eight rooms the excess is three ; in the second eight rooms it is five ; and in each of the two series of nine the excess is four men per room.

All the rooms are warmed by fire-grates of the old pattern. Remodelled grates would save a large part of the fuel.

The rooms are lighted with gas, but the burners are not ventilated. A ventilating funnel and a tube should be carried from over each burner into the chimney, or into the nearest ventilating shaft.

There is no day-room for the men. There are two ablution-rooms in the completed part of the barrack, one under the end wing of the occupied range, and the other behind the range. They require pegs to hang the men's clothes on while washing. These rooms are rather dark.

There are no baths. A bath-house, with one bath to every 100 men, and water laid on, should be provided.

There are two cook-houses, with ten regulation pattern boilers in each ; but no other means of cooking. Each cook-house requires a ventilated roasting oven. The chimneys of one cook-house are in the ball court wall, and blacken it. This should be remedied. There are no cleaning-rooms or drill shed. There are no workshops, except an armourer's shop. The water supply is derived from the water company. It is good and abundant. The roof water is also collected for use.

The sewage is carried away by glazed earthen pipes, and the drains are stated to be all trapped.

The latrines are constructed with arrangements for flushing, but a very small and insufficient quantity of water remains permanently in the trough. The whole were offensive, and are stated to be very much so in warm weather. The building itself is too dark, and the divisions between the seats too low.

We are of opinion that these latrines should be re-constructed, so as to hold water at all times, besides having flushing arrangements. Macfarlane's latrine, such as has been adopted in the married quarters belonging to Raglan barrack, would answer the purpose, but in any case there ought to be a water receptacle. There should be proper divisions between the seats, and if there is space there should be half-doors put up, and additional light and ventilation provided in the roof.

The urinals have no water. A perforated water pipe for washing them out should be provided.

The ash-pits are too deep, and not properly drained. They are otherwise open to the objection arising from the accumulation of decaying matter near inhabited rooms. It would be better to do away with them altogether, and to substitute iron carts, in which to collect and remove the refuse every day.

The canteen is a large commodious building, but the tap-room is too dark. It has an air shaft for ventilation, and requires inlets at the ends like those recommended for the barrack-rooms.

The guard-room requires ventilation, by a silk flap ventilator into the chimney, and by an inlet for air.

The provost-establishment is stated to be deficient in proper provost-serjeant's quarters. There is only one room with an ordinary pattern grate for cooking the prisoners' food, and there is no ablution-room, nor place for the prisoners' bedding on those nights when they are not allowed bedding in their cells.

*The Sanitary Improvements required for Raglan Barracks are the following :—*

1. Ventilation of all the barrack-rooms by shafts and inlets for air ; ventilation of the staircases by louvres through the roof and perforated glass panes in the windows ; ventilation of the non-commissioned officers' rooms by silk flap ventilators in the chimneys ; ventilation of the guard-room by a silk flap ventilator and inlet ; ventilation of the serjeants' mess-room and of the library by two inlets for air ; ventilation of the staff-sergeant's quarters by silk flap ventilators ; ventilation of the canteen tap-room by two inlets for air. Each gas-burner to be ventilated.

2. Reduction of numbers of men in the barrack-rooms to the extent stated.

3. Baths to be provided in the proportion of one bath to 100 men, and pegs to be put up in the ablution-houses.

4. A ventilated roasting oven to be put up in each cook-house.

5. Latrines to have water tanks so that water may stand in them, to have better divisions of seats, and, if possible, half-doors ; also to be provided with additional light and ventilation through the roof. Urinals to be supplied with water.

6. Ash-pits to be removed, and iron carts to be substituted for collecting and taking away the barrack refuse.

*Raglan Barracks.—Married Quarters.*

This is a fine establishment, recently completed, and consists of 100 quarters for married non-commissioned officers and soldiers, so arranged as to form three sides of a square, the fourth side being completed by the cook-houses, laundries, &c. The consideration which has evidently been bestowed on the details of these buildings is most creditable to the gentleman who designed them.

Each married non-commissioned officer has two rooms, and each soldier has one room. The cubic contents of the rooms vary from 1,500 to 1,600 feet, certainly the minimum which ought to be allowed. The building is two stories in height, the upper story in each block being reached by a wide central staircase. A corridor extends the whole length of each flat, and the rooms open right and left out of the corridor. This arrangement should be avoided in future plans. The windows of the rooms are opposite the doors, and a complaint was made that the relative position of the door and window does not give sufficient space for the bed. The upper corridors are lighted by windows only at the ends, and the lower by doors. The light is deficient, and the ventilation of the corridors not very good, although provision has been made for it in the construction. It would very much improve the ventilation of all the corridors to put panes of perforated glass in the upper sashes of the end windows, and to carry a large louvre from the ceiling of each staircase above the roof of the building. The lighting should also be improved by skylights in the roof of the upper corridors, and by slabs of rough glass placed in the floor under the skylights, to admit light to the lower corridors.

Each quarter contains a small Devonshire cooking range.

None of the rooms are sufficiently ventilated. Each room should have a silk flap ventilator in the chimney.

A covered verandah is carried round the interior of the court. It leans against the wall of the buildings above the lower range of windows, so as to darken all the lower rooms on that side. This might be easily remedied by making the roof of the verandah over each window of rough plate glass.

The wash-house is rather dark. It should have a skylight in the roof, and the drying-room should be similarly lighted. Complaint was made of the inefficient action of the drying stove, but it appeared it had been fed with coke instead of coal. There is no ironing-room, but one of the cook-houses might be used for this purpose, as the women prefer cooking in their own rooms, and the cook-houses are not used. The ironing-room should have an access to the drying-room. The other cook-house might be converted into a bath-room for the women and children.

The ash-pit should be done away with, and an iron cart substituted, to be removed daily in connexion with the carts in Raglan barrack.

There is a very good and efficient arrangement of Macfarlane's water latrines and urinals, which, however, would be much improved by proper divisions and half-doors.

Notwithstanding the advantages of these quarters, we are of opinion that the plan adopted in the married quarters at Preston, described in our report on Preston barracks, is decidedly to be preferred. Better plans may yet be contrived, but the Preston plan is the best we have yet seen.

*We would recommend :—*

1. That the improvements in the lighting and ventilation of the corridors and quarters which we have suggested be carried out.
2. That the cook-houses be adapted for an ironing room and bath-room.
3. That an iron cart be substituted for the ash-pit.
4. That light be admitted to the lower rooms through the roof of the verandah, as described.

### 8. New Artillery Barracks.

The new artillery barracks adjoin the town of Devonport, and are constructed to contain one battery. They consist of two principal blocks parallel to each other, with a parade ground between them, of which one block contains the officers' quarters, and the other the men's rooms over the stables.

The guard-house, orderly-room, and cells stand near the gate, and behind the men's quarters are outbuildings, cook-house, workshops, infirmary stables, &c.

The area within the barrack enclosure is 2A. 1R. 21P. in extent. The subsoil is rocky ; all the buildings are of brick, and were erected in 1846.

The accommodation is for 152 non-commissioned officers and men. It is stated to be insufficient, as the batteries have been increased in size since the barracks were built.

The stables are constructed for 16 horses each, eight horses on either side, with a central passage between, from the front of the building to the back. The stables have not sufficient light. They are ventilated by an opening to the outer air at each upper corner, and a flue is carried from front to back in the lower part of the wall, with openings under each manger to act as inlets. This ventilation is not sufficient, more especially as the men's rooms are over the stables, and shafts should be carried up at each corner through the ceiling and through the men's rooms to above the roof. The total sectional area of these shafts should be at least 12 square inches per horse.

The men's rooms are entered by a passage and staircase near each end of the building. Each staircase gives access to two large rooms and a serjeant's room between ; and in each staircase is placed an open water tank under the same roof. This arrangement is not a good one, because its tendency is to keep the air within the barrack-rooms loaded with moisture. We would recommend that each cistern be provided with a close-fitting cover.

There are six men's rooms, with regulation accommodation for 24 men per room. They were occupied at the time of our inspection by 25 men each, with a cubic space rather above 600 cubic feet per man. The rooms are large, light, and airy, and are open to the roof. They have six windows, three on each side, and they are among the very few barrack-rooms we have seen in which the cubic space is sufficient for the health and comfort of the men.

There are no special provisions for ventilation, but this defect could be easily and inexpensively supplied by a louvre in the centre of the ridge of the roof, and by two inlets for air of the usual form, one at each end of the room between the windows near the eaves.

The fire-grates are of the old pattern, and should be remodelled, to warm part of the admitted air.

The ventilation of the staircases should be improved by perforated panes in the upper part of the sashes.

The serjeants' rooms are not ventilated ; they should have a silk flap ventilator in the chimney.

The sashes of all the rooms should be made to open top and bottom.

There are four ablution-rooms in the passages below the serjeants' rooms ; they are small, and their position is not a good one, unless there were an entrance separate from the staircase. Without this, the large, wet, evaporating surface usually existing in an ablution house unnecessarily increases the dampness of the air in the men's rooms. There are no baths. Two are required, with water laid on.

The cook-house has four boilers ; but it has no other means of cooking ; it is unventilated. An oven for baking and roasting meat should be provided, and a louvre should be placed in the roof, together with some perforated glass panes in the windows.

The forge, which adjoins the cook-house, also wants ventilation in the roof.

The privies are similar in construction to those in the Raglan barracks, and are flushed with rain water, They should be remodelled so as to have a sufficiency of water always standing in them ; they should have proper divisions of seats, and, if possible, half-doors, and much more light through the roof.

The urinals should be supplied with water.

There are too many nuisances in these barracks in the shape of manure-pits and ash-pits, some of which are not paved or drained, and are far too deep. An iron cart should be substituted for the ash-pits. There should be one manure heap placed in the most convenient situation for removal, and, if necessary, the stables most distant from it should be furnished with a deep barrow, in which to convey the manure.

There are no litter sheds, the litter being spread, in fine weather, outside the stable-door under the barrack-room windows. Sheds should be erected against the opposite boundary wall.

In the front of the stables near the parade ground stand the troughs for watering horses, which are supported on stone pillars placed in the centre of the gutters, so as to dam them up. This defect requires remedy.

The guard-room is defectively ventilated, and should have a silk flap ventilator in the chimney, and an inlet for air of the usual construction.

The passage which separates the guard-room from the cells should have two perforated glass panes in the upper sash of the window.

The barrack is lighted by candles. Gas can be obtained, and two ventilated gas-burners should be introduced into each barrack-room.

This barrack is deficient in day-rooms, schoolroom, library, laundry, cleaning-shed, and drill shed, and there is no accommodation for married soldiers.

The soldiers' rooms require shelves or cupboards for food and articles of messing.

*The following are the Sanitary Improvements required :—*

1. Ventilation of each barrack-room by a louvred shaft through the ridge, and by two inlets with perforated zinc cornices for diffusing the air. Ventilation of the staircases and lavatories by perforated glass panes in the windows, and the water cisterns in the staircases to have covers provided.

Ventilation of the non-commissioned officers' rooms by silk flap ventilators in the chimneys.

Ventilation of the guard-room by a shaft and inlet, and of the passage to the cells by perforated glass panes in the windows. Ventilation of the cook-house and of the workshops by louvres through the roof.

2. Ventilation of each stable by four shafts carried up from the corner as described.

3. Two baths to be provided with water laid on.

4. A ventilated roasting oven to be put up in the cook-house.

5. Latrines to be reconstructed, with water tanks, and to have divisions of seats, additional light through the roof, and, if possible, half-doors. Urinals to be supplied with water for cleansing.

6. Ash-pit to be removed, and an iron cart substituted. Manure heap to be better placed for removal. Litter sheds are also required.

7. Barrack-rooms to be lighted with ventilated gas-burners.

### 9. Granby Infantry Barrack.

This is a small barrack, with regulation accommodation for 146 non-commissioned officers and men. It is situated close to the town of Devonport, within an area of 2 roods 22 poles in extent. The subsoil is rocky ; the buildings are of stone, and were constructed partly in 1809, partly in 1817. They consist of two portions ; one the barrack proper, and the other a building which was formerly the ordnance hospital. Both are occupied by troops. There are in all 10 soldiers' rooms and two serjeants' rooms ; the latter being occupied by one man each. The following table gives the accommodation in the men's rooms in comparison with what it would it be at 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| Nos. 3, 4 - | 30 | 22 | 8 | 15 | 11 |
| „ 5, 6 - | 32 | 20 | 12 | 16 | 10 |
| „ 7, 8 - | 28 | 20 | 8 | 14 | 10 |
| „ 9, 11 - | 28 | 20 | 8 | 14 | 10 |
| No. 10 - - | 12 | 8 | 4 | 12 | 8 |
| „ 12 - - | 14 | 9 | 5 | 14 | 9 |
| Total - | 144 | 99 | 45 | — | — |

The total accommodation, as nearly as may be, at 600 cubic feet per man, is sufficient for 99 men. The rooms differ very much in the two parts of the barrack. Those in the barrack proper are two stories high, and are reached by a passage and staircase boarded off from the rooms, thus depriving the rooms of the light of one window. The consequence is, that these rooms are gloomy and badly ventilated. They have a window at each end, but one of the rooms for 12 men has only one window.

The rooms in the old hospital are reached by a wide central staircase. They are nearly two feet higher than the rooms in the barrack, and they are well lighted. There is not, however, sufficient provision for ventilation, and we would recommend that each room, both in the barrack and hospital part, should have an air shaft carried up from the ceiling to above the roof, and that each room be also provided with two inlets for air, one at either end, with perforated zinc cornices for diffusing the currents.

More light should be given to the rooms in the barrack proper, by making a window through the partition which divides the passage and staircase from the barrack-room, so as to regain the use of the outer window. The staircase should be ventilated by perforated glass panes in the upper sashes of the stair windows. The serjeants' rooms also require ventilation by silk flap ventilators in the chimney.

All the fireplaces are fitted up with the old pattern grate, wasting a great deal of fuel which might be saved by remodelling the grates.

The barrack-rooms are lighted by candles ; gas can be procured, and a ventilated gas-burner should be introduced into each barrack-room.

There is only one ablution-room, which is too small, and too far removed from part of the barrack. The ablution table requires a ledge round it to prevent the water dashing over upon the men. The ablution house has no pegs, and it is defectively lighted and ventilated. It would be improved by glass slates in the roof, and by perforated glass panes in the windows, but being too small and there being no place for baths, it would be advisable in providing a bath-house with a bath, to increase the ablution accommodation under the same roof.

There are two cook-houses, with three boilers each, but there are no other means of roasting meat. Each cook-house should have a ventilated roasting oven, and more light and ventilation through the roof. There is a women's wash-house with a boiler, but it has no other accommodation for washing or getting up linen. It should be provided with fixed tubs having water laid on, and should have more ventilation through the roof, and perforated panes in the windows. It should also have a drying and laundry stove.

There is a good supply of water obtained from the water company and from wells.

The officers' privy empties into a cesspit, which ought to be abolished, and a properly drained water-closet substituted. The men's latrines are drained and flushed, but water does not stand in them, and they are very offensive in consequence. A latrine with a water tank on Macfarlane's principle, with divisions of seats and half-doors, ought to be substituted, and the building should have more light and ventilation. The urinals also require reconstruction, with water laid on for cleansing.

There is an ash-pit close to the men's rooms, which ought to be removed, and an iron cart substituted for collecting and taking away the refuse, in combination with a similar arrangement for the Royal Artillery barracks.

Granby infantry barrack is deficient in the following accommodation :—day-room, school-room, library, married quarters, cleaning-room, workshops, and non-commissioned officers' rooms and mess.

The guard-room is small and defectively ventilated. A new one is provided for in the annual estimates, and when it is built, the present guard-room would answer the purpose of an additional ablution-room and bath-room.

*The Sanitary Improvements required are as follow :—*

1. Reduction of numbers in the barrack-rooms to the extent specified.

2. Ventilation of every barrack-room by a shaft and two inlets for air. Opening an additional window to each room in the barrack proper. Ventilating the staircases by perforated panes in the windows. Remodelling the barrack-room grates, to warm part of the admitted air. Ventilating the serjeant's room by silk flap ventilators in the chimneys.

3. A ventilated gas-burner to be introduced into each barrack-room.

4. The present ablution-room to be improved by additional light through the roof ; ventilation by perforated glass panes ; pegs on the walls ; and by a ledge to the ablution table. An additional ablution-

room to be built, with accommodation for one fixed bath, or the present guard-room to be fitted up for the purpose.

5. Cook-houses to be provided with ventilated roasting ovens, and with additional light and ventilation through the roof.

6. Women's wash-house to have fixed tubs, with water laid on, a drying and laundry stove, and additional ventilation.

7. Officers' privy to be drained, and the cesspit abolished. Men's privies to be reconstructed as water latrines, with division of seats, half-doors, light, and ventilation. Urinals to be reconstructed and supplied with water.

8. Ash-pit to be abolished, and arrangements to be made for daily removal of the barrack refuse.

### 10. Mount Wise Barracks.

These barracks consist of a number of small detached blocks of stone building, constructed originally as an ordnance laboratory, but now used as barracks for artillery. They stand on the slope of a hill towards the Hamoaze, and occupy an area 1A. 3R. 4P. in extent. Some of the buildings are single cubes of one story, but the majority of the men's rooms are in long buildings, some one, some two stories high. They are arranged in two parallel lines, with a parade ground between them, and the outhouses are situated along the bonndary wall behind one of the ranges. There are five non-commissioned officers' rooms and 15 men's rooms. The total regulation accommodation is for five non-commissioned officers and 257 men.

The men's rooms differ considerably in size, and the amount of cubic space allowed in the rooms also varies.

The accommodation in each room is given in the following table :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| Nos. 16, 27 - | 46 | 30 | 16 | 23 | 15 |
| „ 17, 28 - | 42 | 40 | 2 | 21 | 20 |
| „ 19, 22, 26 | 27 | 24 | 3 | 9 | 8 |
| „ 20, 21 - | 50 | 38 | 12 | 25 | 19 |
| „ 23, 25 - | 24 | 18 | 6 | 12 | 9 |
| No. 30 - | 12 | 9 | 3 | 12 | 9 |
| Nos. 31, 33 - | 32 | 32 | – | 32 | 32 |
| No. 32 - | 24 | 23 | 1 | 24 | 23 |
| Total - | 257 | 214 | 43 | — | — |

From the circumstance of these barracks being constructed in detached blocks we have in the preceding table allowed rather less than 600 cubic feet in calculating the accommodation. The excess of occupants of the rooms is, however, 43.

With the exception of rooms 20, 21, 31, 32, 33, all are very deficient in light and window space, and this defect is one of the first that ought to be supplied. Additional windows should, wherever practicable, be placed on the opposite sides of the rooms, to admit of thorough ventilation by opening all the windows; but if from any circumstance this cannot be done, a sufficient number of skylights made to open should be introduced in the roof. All the windows should be made to draw down at the top. None of the rooms are ventilated.

In supplying this defect the following principles require to be kept in view. In all the rooms which are not ceiled ventilation by louvred turrets in the ridge should be adopted. In the longer rooms two of these turrets should be introduced, and in the short rooms one will be sufficient. In all the ceiled rooms ventilating shafts should be carried from the ceiling to above the roof. The larger rooms will require two of these shafts, and the shorter rooms one. Each room will require inlets covered with perforated zinc diffusing cornices placed close to the ceiling or eaves. The longer rooms will require four such inlets and the shorter rooms two. The same method of ventilation requires to be introduced into the guard-room, library, school-room, and workshops. The guard-room also requires additional light The serjeants' quarters need ventilation by a silk flap ventilator into the chimney. The staircases leading to the upper rooms are dark, and require skylights or windows with perforated glass panes for ventilation.

The barrack is lighted with candles, although gas can be obtained.

We would recommend that two ventilated gas-burners be introduced into each of the longer rooms, and one similar one into each of the shorter ones.

All the grates are of the old pattern, and should be replaced by better grates to save fuel.

There is no day-room.

There is one ablution-room, situated at too great a distance from some of the barrack-rooms. It has no pegs, and the ventilation is deficient. The latter might be easily improved by a few perforated glass panes in the windows. There are no baths, although, possibly, space might be obtained for two in this lavatory. At all events two fixed baths, with water laid on, are required.

There is one women's wash-house, containing one copper supplied with water, but the wash-house is not provided with any other conveniences for washing or getting up linen. It is too dark, and should have a few glass slates in the roof to increase the light. It should also be fitted up with fixed tubs, and water laid on, gratings for the women to stand on, and a drying and laundry stove.

There is a good, well ventilated cook-house at the lower end of the barrack yard. It would, however, be materially improved by a few glass slates in the roof, and by additional ventilation through perforated panes of glass in the upper window sashes. It should have a ventilated roasting oven, as there are no means of cooking at the present time except by boiling.

The canteen tap is dark and not sufficiently ventilated, and requires a window at the back with bars and a silk flap ventilator into the chimney.

The prison cells and lock-up room are not sufficiently ventilated. The former should have a shaft from the ceiling through the roof, and the latter an inlet for air opposite the present window.

There is a drained privy which admits of being flushed out, but it was very offensive, and it gives rise to nuisance in the adjacent quarters. This privy should be converted into a water latrine on Macfarlane's principle. It should be properly lighted and ventilated, and should have divisions of seats and half-doors.

The adjoining urinal also requires reconstruction on a better plan, with water supplied to it for cleansing.

The ash-pits in these confined barracks ought to be abolished, and an iron cart, with daily removal of refuse, substituted. One contractor with a spare cart or two might easily cleanse all the barracks in this neighbourhood, and prevent any accumulation of decomposing matter near the men's quarters.

Outside the barrack gate are situated the officers' quarters, which are complained of as insufficient. The privy arrangements are defective, and proper water-closets should be substituted. The mess-room has no ventilation. A silk flap ventilator ought to be placed in the chimney.

*The following are the Sanitary Improvements required for Mount Wise Barracks:—*

1. Reduction of the number of men in the barrack-rooms to the extent specified.

2. Ventilation of every barrack-room by shafts and inlets as described. Darker barrack-rooms to have additional windows or skylights. Dark staircases to have a window with perforated glass panes for ventilation, or a skylight. All windows to be made to

draw down at the top. Guard-room to be ventilated by a shaft and inlet. Lock-up to have an inlet opposite the window. Cells to be ventilated by shafts. Library, school-room, and workshops to have shafts and inlets provided. Serjeants' quarters to be ventilated by silk flap ventilators into the chimneys. Canteen to have an additional window, and a silk flap ventilator into the chimney. Barrack-room grates to be remodelled, to save fuel and warm part of the admitted air in winter.

3. Ventilated gas-burners to be introduced into the barrack-rooms.

4. Pegs to be supplied to the ablution-room, and also a few panes of perforated glass for ventilation. Two fixed baths, with water laid on, to be provided.

5. Women's wash-house to be provided with fixed tubs, and water laid on; and to have a drying and laundry stove, gratings for the feet, and a few glass tiles in the roof.

6. Cook-houses to have a ventilated roasting oven put up, and to have additional light and ventilation by glass tiles in the roof, and by perforated glass panes in the windows.

7. Privy to be reconstructed as a water latrine, with divisions of seats and half-doors, and to be properly lighted and ventilated. Urinal to be reconstructed and supplied with water.

8. Ash-pits to be done away with, and an iron cart, with daily removal of the barrack refuse, substituted.

### 11. Bull Point Barracks.

Bull Point barracks are situated about four miles to the north of Plymouth, near the river Tamar, in an elevated healthy position, with ample facilities for drainage. They are constructed to accommodate 96 men and four serjeants.

The buildings are of brick, of recent erection, and consist of two blocks running along one side of the parade ground. One block contains officers' quarters, and the other soldiers' barracks. In rear of the quarters, and separated from them by a narrow back-yard, are the ablution-room, cook-house, privies, ash-pit, &c.

The soldiers' rooms are in two flats. They are entered from the rear by a passage and staircase, which do not go through the building. A serjeants' room fills up the end of the passage opposite the door, and two soldiers' rooms enter right and left from the passage. These rooms occupy the whole width of the building, and have two windows at each end. The door is in the centre of the side, and the fireplace, with the ordinary pattern grate, is opposite the door.

The following table shows the accommodation :—

| Rooms. | Total Present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 6 | 96 | 78 | 18 |

Each of the six rooms accommodates 16 men, in a space which would afford 600 cubic feet per man for 13 men only. The total deficiency of accommodation on this calculation is, therefore, that for 18 men; but the site of the barrack being high and airy, the deficiency is of less importance than it would be in a larger barrack situated in a less favourable position.

The rooms have no means of ventilation, except the windows, door, and chimney.

Each room should have a shaft, and two inlets for air close to the ceiling, one at each end, and the grates should be remodelled, to economise fuel, and to warm a portion of the air admitted for ventilation.

There are four serjeants' rooms, each of which should have a silk flap ventilator into the chimney, and panes of perforated glass should be put into the upper sash of each stair window. The rooms are lighted with candles; gas cannot be obtained at present.

There is no day-room or school-room.

There is no library, but there is a reading-room, which is half a barrack-room, the other half being a regimental store. The reading-room requires a shaft and inlet for air.

The ablution-room is rather dark. Additional light should be given to it by glass tiles in the roof. It has no pegs, and it is not supplied with water. Pegs should be provided, and water laid on to the ablution tables. There is no bath. One is required, with water laid on.

The women's wash-house is dark, and should have more light by glass tiles, and a louvred outlet for the steam through the roof. The tubs should be fixed, and should have water laid on. A drying stove should also be provided.

The cook-house also requires more light through the roof; it has four boilers, but no other means of cooking. An oven to roast and bake meat is required.

There is no drill-shed nor workshop, and there are no married quarters.

The privies have small slate divisions, rising about 1 foot 6 inches above the seats. The seats are over a long sewer, extending from the yard behind the officers' quarters, which forms a receptacle for the soil. This sewer is flushed by means of a tank containing about 2,000 gallons of water, which, when full, is rapidly discharged along the sewer by means of a syphon. This arrangement does not allow of water standing in the privy, as it ought always to do, and whilst it occasionally cleans the bed of the sewer, it does not prevent accumulation against the sides, from the too great depth of the receptacle. The large quantity of water required each time to fill the syphon prevents the flushing being done, except at considerable intervals of time, because the tank is only filled by the waste water from the ablution-rooms, pumps, &c. It would be desirable to reconstruct these privies with a comparatively shallow receptacle, in which water should always stand, with a proper apparatus for flushing at short intervals, and to arrange for a sufficient supply of water by an additional tank for storeage during dry weather, if there is not found to be water enough. When the latrines are reconstructed they should have proper divisions, and half-doors, if there be space for them.

Water is derived partly from the roof, by being received into a large underground tank. The whole of the roof water should be caught and retained, to be used for the women's wash-house, and for baths as far as possible. Besides the rain water supply there are four wells, about 30 feet deep, of which three are stated to become dry in summer.

The urinals should be supplied with water, for occasional flushing.

An ash-pit is placed in the narrow back yard, behind the men's rooms. It is too large, and not properly drained. It should be removed from its present site altogether outside the barrack enclosure, and the barrack refuse should be at once removed to it, instead of being accumulated close to the quarters.

The guard-room is large and roomy. It was occupied when we were there by one corporal and three men. It would be desirable to remodel the grate, so as to economise heat, and to place a silk flap ventilator in the chimney. The officers' guard-room is at present used as a children's school.

The cells are imperfectly ventilated; they require a shaft each through the roof, and an inlet formed by a grated opening into the passage, along with a grated opening from the passage to the open air; a stove for warming the air should be placed in the passage.

There is an ash-pit in the yard close to the cells, which should be removed.

The privy is also close to the cells; it should be converted into a water latrine, with water always standing in it.

There is a privy and urinal to the guard-room, but no ablution-room.

There is a good cleaning shed and ball court.

The canteen is sufficient, but the tap-room requires

a silk flap ventilator in the chimney, and a perforated glass pane in the upper sash of two windows for ventilation,

The non-commissioned officers' room in the canteen also requires a ventilator in the chimney.

Complaint was made by the barrack master that the coal was much deteriorated by there being no shed to cover it. This is, however, a general question and applicable to all barracks.

At the end of the block which contains the soldiers' quarters there is one sick ward, and a surgery at the top of a flight of stairs, entered from the end of the building; below the ward is the regimental store, entered from the same passage, and below the surgery is the reading-room, entered from another passage. The ward has one window at the end and two on the side; it is not used as a hospital, but simply as a room into which any case of illness may be taken from a barrack-room until the ambulance removes it to the general hospital at Stoke Devon. The ward is at present lent to married people. The ward should have a silk flap ventilator in the chimney, and a Moore's louvred ventilator in one window. The windows in the passage, viz., the one over the door downstairs, and the one at the end of the passage upstairs, should each have a perforated glass pane.

*The Sanitary Improvements required for these Barracks are as follows:—*

1. Reduction of number of men in the barrack-rooms.

2. Ventilation of each barrack-room and the reading-room by a shaft and inlets. Ventilation of each non-commissioned officer's room by a silk flap ventilator into the chimney. Ventilation of the staircases by perforated glass panes in the upper sash of the windows. Ventilation of the hospital ward by a silk flap ventilator and by a Moore's ventilator in one of the windows. Ventilation of the canteen tap-rooms and guard-room by silk flap ventilators. Ventilation of the cells by shafts and gratings, as described. Barrack-room and guard-room grates to be remodelled.

3. Ablution-room to be better lighted by glass tiles in the roof. Water to be laid on and pegs provided. One bath, with water laid on, to be provided.

4. Cook-house to have a roasting oven, and more light by glass tiles in the roof.

5. Women's wash-house to have a louvre in the roof for ventilation, and glass tiles for additional light. Tubs to be fixed and water laid on. A drying stove to be provided.

6. All the privies to be reconstructed as water latrines, with proper divisions, and, if possible, with half-doors. Urinals to be supplied with water.

7. Ash-pits to be removed outside the barrack enclosure.

### 12. General Hospital, Stoke Devon.

This is one of the best hospitals belonging to the army. It is designated as a general hospital, but its administration is rather that of an agglomeration of regimental hospitals, to which the sick are transported by ambulance from the different barracks belonging to the garrison. It is situated on the banks of Stonehouse Creek, within an enclosed area of 9 acres and 35 perches.

The grounds are intended for convalescents exercising. It is stated that 15*l.* per annum are allowed for keeping them in order. The sum is evidently not sufficient, for they are in an untidy condition.

The surface of the ground slopes rapidly towards the creek, and the hospital is built across the line of natural drainage, at a short distance from high-water mark. The mud banks on both sides of the creek are exposed to a considerable extent at low water, and very offensive effluvia arise from them, especially during warm close weather. It was at one time supposed that these effluvia proceeded from sewage being allowed to run over the mud banks between high and low water; but we have been informed such is not the case, and that the sewage is now conveyed below low-water mark.

The injurious influence of these mud exhalations is seen on the course of disease in the hospital; and certain classes of cases and of wounds linger, and either recover very slowly or have to be sent away to recover. The site is a bad one, like all sites on the banks of tidal estuaries in which mud is exposed at low water, and it cannot be remedied, except at a great cost.

The hospital consists of four pavilions, each three stories high, ranged side by side, at a short distance from each other, and connected along one end by an open arcade or corridor, enabling all the wards and offices to communicate with each other under cover. An open terrace runs along the top of this corridor, and communicates by a door with the first flat of each pavilion.

The pavilions are of a somewhat singular construction. They are divided lengthwise by a narrow hanging stone staircase, extending the whole depth of the pavilion from the corridor backwards, and from the ground floor to the roof, so as to divide the pavilion into two equal halves, right and left of the staircase. The wards enter right and left of the landings. The staircase is lighted and ventilated through the roof by large skylights. The ventilation would be improved by having a few perforated glass panes inserted into the staircase windows.

The wards, with one exception, extend the whole length of the pavilion, and have the walls of three of their sides exposed to the air. There are windows, eight in number, giving light to each ward. The wards, with one exception, are 60 feet long and 24 feet wide. They are 14 feet 6 inches and 11 feet 6 inches high. They accommodate 22 sick each, with the exception of one small ward, which holds six beds. The following table shows the accommodation of each ward, compared with what it would be at 1,200 cubic feet per bed, the amount which we are required to allot by our instructions: —

| Pavilion. | Wards. | Present Accommodation. | Accommodation at 1,200 Cubic Feet per Bed | Deficiency of Accommodation in Bed Spaces. |
|---|---|---|---|---|
| 1 | Nos. 1 | 22 | 18 | 4 |
| | 2 | 22 | 18 | 4 |
| | 3 | 22 | 15 | 7 |
| | 4 | 6 | 6 | – |
| 2 | 1 | 22 | 18 | 4 |
| | 2 | 22 | 18 | 4 |
| | 3 | 22 | 18 | 4 |
| | 4 | 22 | 18 | 4 |
| | 5 | 22 | 15 | 7 |
| | 6 | 22 | 15 | 7 |
| 3 | 1 | 22 | 18 | 4 |
| | 2 | 22 | 18 | 4 |
| | 3 | 22 | 18 | 4 |
| | 4 | 22 | 18 | 4 |
| | 5 | 22 | 15 | 7 |
| | 6 | 22 | 15 | 7 |
| 4 | 1 | 22 | 18 | 4 |
| | 2 | 22 | 18 | 4 |
| | 3 | 22 | 15 | 7 |
| | 4 | 22 | 15 | 7 |
| Total - | 20 | 424 | 327 | 97 |

In this table we have divided the cubic contents of each ward as nearly as may be into spaces of 1,200 cubic feet; but in every instance the space we have allotted per bed is under that amount. To give it, however, 97 beds will have to be removed from the wards.

The wards have each two air shafts built in the wall and carried up above the roof of the pavilion. The conjoint area of these shafts is hardly large enough to afford the necessary ventilation, and we

would recommend a large silk flap ventilator to be introduced into each chimney, to increase the amount of outlet. Each ward requires two inlets to be placed in the length of the wall, opposite the fireplace, close to the ceiling, to be provided with perforated zinc cornices of the usual construction, for diffusing the admitted air.

These trifling alterations will render the ventilation sufficient.

The skirting in the wards is of wood, and is six feet high. It harbours vermin, and ought to be removed, and the wall cemented instead.

The wards are warmed by grates of the old pattern, one in each ward, nearly in the middle of its length. These grates might be remodelled with advantage to save heat. The staircases are warmed by Nettleton's stoves.

The wards are lighted with candles, and the corridor with oil lamps. The lighting is very deficient, and gas should be substituted. Each of the long wards requires two ventilated gas-burners.

There are no baths connected with the wards, but there is an apartment furnished with slipper baths, &c. between two of the pavilions. The difficulty of reaching it is so great, that it may be considered as of very little use; and it will be necessary to provide suitable baths in connexion with each floor of the pavilions.

There is a laundry for washing the hospital linen, situated at a short distance from the building. The arrangements appear to be sufficient.

There is a good kitchen, adequately supplied with the means of cooking hospital diets. It is at a considerable distance from some of the wards; nevertheless, with proper care, the diets may be delivered hot to the sick.

The water supply is good and abundant, and is obtained from the Devonport Water Company.

The drainage is defective in some points, and, in consequence, there is considerable nuisance, at times, from the water-closets.

It is stated, in a return made to us, that, connected with the hospital, there is a large cesspit which receives the drainage, and which has an overflow into the creek. Should this be the case, it will sufficiently account for the nuisance proceeding from the water-closets, and also for that arising from the gulley grates.

Besides which, if the sewers are not sufficiently ventilated, the rise of the tide must force the sewer gases back into the building. If the cesspit really exists, there can be no question that it ought to be filled up, and a ventilating opening should be made into each of the outlets above high-water mark, and at as great a distance as possible from the hospital. A small pipe should also be attached to each of the water-closet tubes, and carried above the roof of the pavilion.

Each ward has a water-closet entering directly from it. These water-closets are neither sufficiently isolated nor ventilated, and they should be reconstructed in the manner to be hereafter mentioned. At the end of each pavilion furthest removed from the entrance, there is a projection built out, containing the hospital serjeant's quarters, and in this projection are placed the ward sinks, as well as the water-closets, the ward sinks entering from the staircase. The sick wash at these sinks in hand-basins belonging to the wards. The best that can be said of this lavatory accommodation is that it is better than none. There is no doubt that it requires entire reconstruction, with fixed basins, and hot and cold water laid on. There are no proper urinals belonging to the wards.

The obvious method of remedying the deficiencies in baths, lavatories, urinals, and water-closets is to add to the projecting building in which are situated the hospital serjeant's quarters. This can be done without interfering with the light and external ventilation of the wards. In doing so space should be provided either for one fixed bath with hot and cold water laid on for each flat, or for two baths on one of the floors of each pavilion, as may be found most economical, with sufficient additional space to enable each water-closet to have a separate ventilated lobby between it and the ward. Sufficient space will also be required for the ablution basins and urinals.

There are two or three ash-pits near the hospital, which ought to be removed, and provision made for collecting and carting away the hospital refuse daily.

At a comparatively small expense this hospital might be very much improved in these sanitary points. The only way of improving the site would be by banking out the creek, and covering the mud bank, as is proposed at Netley.

There are excellent water latrines on Macfarlane's principle outside the building for convalescents, &c. The urinals are much complained of, and require reconstruction, with water laid on. Several wards in the pavilions are misappropriated, as stores of various kinds, such as pack store, bedding store, provision store, apothecaries' store, &c. We think it unadvisable that space, which is so much required for sick, should be devoted to storeage, which ought not to be within the pavilions at all. The proper place for these stores is certainly not within the hospital, and if they were removed, and provided for by the erection of a suitable building, the pavilions would afford all the hospital accommodation required for the station.

In another respect the accommodation is defective. There is no waiting-room for patients, and the provision made for orderlies is insufficient. In a number of the wards they sleep among the sick, but in one pavilion there is a ward appropriated for their use. It would be easy, in extending the projection behind each pavilion, as already mentioned, to provide a room for the night orderly, but all the others should sleep away from the sick.

There is no accommodation provided in any building for the sick wives and children of soldiers' families, and it has been stated to us that the civil medical charities refuse to admit them. This is a deficiency which ought certainly to be supplied.

*The following are the Improvements required for this Hospital :—*

1. Reduction of the number of beds to the extent stated.

2. Ventilation of each ward to be improved by a silk flap ventilator into each chimney, and by two inlets for air, as described; remodelling the ward grates to save heat; inserting panes of perforated glass into the upper sash of each staircase window.

3. Extending the projecting building behind each pavilion, providing in it a fixed bath, with hot and cold water, for each flat of the pavilions; providing a lavatory with fixed basins, and hot and cold water, with separate hot and cold water taps, for drawing water for use in the wards; improving the water-closets by interposing a lighted and ventilated lobby between them and the wards, and providing a urinal in connexion with the water-closet; ventilating the soil pipes of the closets, by carrying a small pipe from them above the roof of the building.

4. Improving the hospital drainage by abolishing the cesspit, and ventilating the outlets immediately above high-water mark.

5. Reconstructing the urinals outside the hospital, removing the ashpits, and arranging for the daily removal of the hospital refuse.

Lastly. Better accommodation should be provided for the orderlies. A waiting room and proper stores should be erected, and the whole space within the pavilions used for sick.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, February 4, 1859.*

# EASTERN DISTRICT.

Sir,

Having examined into the sanitary condition of the barracks and hospitals at Colchester, Harwich, Yarmouth, Norwich, and Ipswich, we have the honour to transmit to you the following reports on them.

## 1. COLCHESTER CAMP.

Colchester Camp is placed on high ground, about a mile to the south-east of the town. The situation is open, airy, and healthy. The subsoil is gravel, and may be considered as self-draining ; but it is not on that account to be depended on for drainage to the neglect of other means, because porous soils occupied by a numerous population, as is the case with this camp, may be a source of health or of disease to the inhabitants in proportion as their drainage is made efficient or is not attended to.

The occupied ground is a parallelogram, 32A. 2R. 12P. in area, enclosed within a wall higher than the huts, whereby the free sweep of the air over the camp is materially impeded.

Within this area are congregated 2,469 non-commissioned officers and men, 219 women with their families, belonging to married soldiers ; so that, including officers, the population exceeds 3,000 persons, giving a density of 51,000 to the square mile.

The barrack accommodation consists entirely of huts arranged side by side, at about 20 feet from each other. The ends of the huts are towards the wider thoroughfares, which run in parallel lines the length way of the camp.

The first thing which strikes the eye in the arrangement is this, the huts are much too close together to be healthy, and that it would have been much safer to have placed them at double the distance from each other.

Almost the entire area of ground presents an appearance of dampness. Foul water was lying in defectively made gutters here and there, and we were informed that, during wet weather, parts of the surface became wet and sloppy. These two conditions, overcrowding of surface area, and a wet, undrained state of the subsoil, are hazardous to health even in the open country.

But the huts themselves are also overcrowded. At the time the return was made to us, the men's accommodation consisted of 120 of these wooden huts. Each hut is 38 feet long, 20 feet broad, and 9 feet high, giving 6,840 cubic feet of contents, and to each of these huts twenty-four men were allotted, giving, on an average, only 285 cubic feet per man. The following table gives the accommodation, in comparison with what it would be at 400 cubic feet per man, the amount which ought to be sufficient for health in properly constructed and properly arranged camp huts in this climate :—

| Huts. | Total present Regulation Accommodation. | Total Accommodation at 400 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 120 | 2,880 | 2,040 | 840 |

At the very moderate allowance of 400 cubic feet per man, the accommodation at Colchester Camp was deficient to the extent of 30 per cent. at the time referred to. Although the camp consists essentially of wooden huts, there are some huts constructed of iron. In all iron or brick huts the essential quality of wooden huts, namely, their being pervious to air, is wanting, and they do not admit of healthy occupation with less than 600 cubic feet per man.

In order to diminish the effect of overcrowding on the health of this camp, it will be necessary to reduce the accommodation in wooden huts from 24 men to 17 men per hut, and in iron huts, of the same dimensions as the wooden huts, the numbers should be reduced from 24 to 12 at the very least. Eleven men per hut would be a better number, but it would allow more than 600 cubic feet per man, while 12 men will have a small fraction under that amount.

The huts generally are not raised high enough above the ground. There should be at least one foot or 18 inches of clear space above the level, with free ventilation underneath.

The average number of windows per hut is 10. They are 3 ft. 10 in. wide by 2 ft. 9 in. high, and are placed along the sides and at the ends.

Ventilation is provided by several louvres in the length of the ridge. The state of the air was, nevertheless, far from being pure in huts even partially occupied during the daytime when we inspected them. One cause of atmospheric impurity in these and similarly constructed huts is the want of a porch in which to keep urine tubs, mops, &c. The urine tubs are of course placed in the huts at night, and during the day, after being emptied, they are partially filled with water and placed in a corner of the hut. It would be an immediate improvement in this camp to provide a porch for each hut, where the urine tubs could stand by night as well as by day, so as to free the interior from the present nuisance arising from these tubs.

Warming is effected by iron stoves. They are dangerous, and bad in other respects. Brick fireplaces, with remodelled grates, would be more economical and healthy.

At the time of our inspection the huts were lighted with candles, although there was gas in the canteen within the area. There can be no doubt of the greater economy of gas, and we would certainly advise its being introduced throughout.

There are three school-rooms and one excellent library, but no day-room. There was space, however, on which a suitable hut for the purpose could be erected.

Ablution accommodation, consisting of six huts, with benches, basins, and gratings, have been provided. They all require pegs for hanging coats on.

An excellent form of bath has recently been provided for these ablution houses. It is built in the ground and lined inside with cement. It is among the cheapest forms of bath we have met with, and should it prove to be durable it might be introduced where similar material can be obtained. There were three such baths with water laid on in small light bath closets at one end of the ablution houses we examined, and this accommodation is being extended.

Washing is done in six women's wash-houses. They have boilers, and are supplied with water from pumps close at hand. The floors were very imperfectly drained at the time we saw them, and there were no means of drying linen. All these wash-houses should be improved in the same way. They should be provided with washing troughs and water laid on, and the troughs should be drained properly, instead of the foul water being emptied on the floor. Drying closets, or at least drying stoves, and means of ironing linen should also be provided.

There are 13 iron cook-houses provided with boilers, but not all provided with ovens. Various forms of arrangement of boilers and ovens were in use. The whole appeared to be in a transition state towards a better provision for varying the cooking.

There are no drill-sheds, and this want is much felt in this camp on account of the large number of men constantly under training.

The only workshops are six for tailors, and the same number for shoemakers. There is no general provision for employing the men.

Water for the whole camp is derived from 24 shallow wells, dug in the porous subsoil on which the camp is situated. It would be most advisable to obtain another source of supply, and to have the water laid on constantly, instead of drawing it from

shallow wells, which are liable to become polluted by infiltration from the inhabited surface above.

We have already alluded to the condition of the surface drainage. There was some provision for removing the roof water by imperfectly-formed gutters, and also for removing the waste water from ablution and bath-rooms, cook-houses, &c. by shallow drains, but there is no proper sewerage for latrines, and the subsoil is not drained.

The greatest care is required in laying out the drainage of fixed camps. The whole area occupied either by tents, huts, or parade grounds should be so thoroughly underdrained to the depth of four feet as to prevent water accumulating in the subsoil. This is a cardinal point in the laying out of all permanent camps, and is one of the most essential improvements required for Colchester camp.

From want of this, and also from overcrowding and defective ventilation, both within and without, this camp has suffered from severe types of fever, from which the men would in all probability have escaped in permanent barracks.

Fixed camps in well chosen positions will be much more healthy, or less healthy than permanent barracks, just in proportion as sanitary precautions are observed or overlooked. This is the experience of all camps. It only requires a little time to show the consequences of sanitary defects in them.

A short time ago the latrines of Colchester camp were reconstructed with iron pans, in which the soil is collected and removed nightly. They are placed in iron hut buildings. This arrangement gives rise to a constantly recurring nuisance and cost, although it is far less likely to injure the health of the camp than cesspits would be. Its adoption is therefore a step in the right direction so far as regards health, but it would in our opinion be far preferable to sewer and drain the camp properly and to provide water latrines from which the soil could be flushed to an outlet where it could be applied for manure.

If such an outlet or any other outlet for the latrine drainage cannot be obtained we still recommend that water latrines, from which the contents could be removed daily in a closed cart, should be introduced, for by this arrangement the nuisance from the latrines would be prevented.

The accommodation for married non-commissioned officers and soldiers consists of 207 rooms. Generally they are formed of ordinary barrack huts, divided by bulkheads into eight very small apartments.

In 147 of these rooms there are no proper means of cooking, generally one small stove to six families. Part of the married quarters we inspected were hardly fit for occupation. They were overcrowded and every way uncomfortable, but it was stated to us that they were occupied only temporarily.

There are three small mess-rooms for non-commissioned officers.

There are five guard-rooms and a provost establishment. The guard-rooms are not sufficiently ventilated.

One of the best portions of the camp is the canteen, a large wooden building erected by the canteen keeper under inspection.

The rooms and bar are of a very superior order, large, roomy, well lighted by abundance of windows, and by gas at night. The rooms are ventilated and very comfortable. Along the front of the building there is a verandah with a glass roof, light and cheerful, affording protection to the men in wet weather without interfering with the light of the tap-rooms. Altogether the establishment is one of the best we have seen.

*The Sanitary Improvements required for Colchester Camp are as follow:—*

1. Reduction of overcrowding by limiting the number of men in each wooden hut to 17, and in each iron hut to 12.

2. Increasing the number of ridge louvres for ventilation by adding other two to each hut. Ventilation of guard-rooms to be improved.

3. Affording to each hut free ventilation under the flooring, so far as it may be practicable to do so.

4. Each hut to have a porch, capable of protecting the entrance, and affording space for urine tubs, &c.

5. Underdrainage of the whole camp to dry the subsoil. Improvement in the surface drainage by better guttering.

6. Privies to be converted into water latrines, either drained to a suitable outlet or, if that be impracticable, the contents of the latrines to be flushed daily into a water-tight cart and removed. Proper urinals to be constructed in connexion with the improved latrine arrangements.

7. Gas to be introduced into the huts.

8. Ablution-rooms to have pegs.

9. Womens' wash-houses to have fixed tubs, water laid on, and means of drying and ironing linen.

10. A better water supply for the camp to be provided.

Lastly, the deficiencies in married quarters, day-rooms, &c., should be remedied at the earliest possible period.

*Colchester Camp Hospital.*

This hospital consists of a double range of wooden huts, with the ends fronting each other, leaving a long wide passage between the rows, which passage is covered throughout its entire extent by a wooden roof. The huts are much too close to each other for thorough light and ventilation, and together with the long gloomy passage, the whole establishment has not that light cheerful look which it might have had.

It is enclosed by a railing within which there is a sufficient exercising ground for convalescents.

There are altogether 19 hospital huts, containing 12 beds in each, with 696 cubic feet per bed.

The huts are of the usual construction and are raised above the level of the ground. They are 38 feet long, 20 feet wide, and 11 feet high, with sloping roofs. There is a partial wooden ceiling, in which are two circular ventilating openings a foot in diameter, communicating with a ventilator at each end. The principle is not a good one, and we should advise that instead of it a shaft should be carried from each ceiling, opening through the roof.

Each ward is warmed by stoves. There are lavatories and a bath. The kitchen arrangements are sufficient for hospital cooking.

The drainage is of the same character as the barrack drainage generally, and should be improved along with it. Iron pans are used instead of latrines and water-closets. Water latrines properly drained would be much better.

Water is obtained from a well 48 feet deep, within the hospital enclosure. It requires much labour to raise the quantity required, and a better source of supply should be provided for both camp and hospital.

Candles and lamps are used for lighting the building, although gas could be obtained.

The storeage is said to be rather limited in extent for a hospital of this size.

The main defects of Colchester hospital are similar to those of the barracks. It is not sufficiently exposed to free circulation of air outside, and the ground is not sufficiently drained. The huts are too close together, and this circumstance, together with the corridor, gives the wards a dark appearance. The ventilation is not enough. In other points, such as the kitchens, the arrangements are good.

*The following are the chief Improvements we would recommend:—*

1. Ventilating the wards directly by shafts through the roof.

2. Improving the drainage of the whole site, and converting the present privies into water latrines, drained to an outlet.

3. Introducing gas.

## 2. LANDGUARD FORT, HARWICH.

Landguard Fort is situated on a long spit of shingle forming the eastern boundary of Harwich harbour.

It is surrounded by a deep ditch, completely isolating the area occupied by the buildings of the fort from the neighbouring ground, a point, as we shall presently show, of much importance as regards the drainage of the fort. The buildings are arranged in square behind the ramparts, leaving a parade ground in the middle. The men's rooms are on the west side, and at the end of the range is situated the hospital, which is simply a continuation of the range.

The officers' quarters form the north side of the square. The other two sides are occupied by the guard-room, stores, &c.

The men's rooms are in three stories. Part of them are reached by stairs and passages from the parade ground; part of them by stairs leading from the ramparts behind.

The buildings are of brick, and of old construction. There are 26 barrack-rooms, several which are less than 8 feet high, and none of them exceed 8 feet 4 inches in height. They vary in length from 15 feet 5 inches to 30 feet 10 inches, and in breadth from 11 feet 9 inches to 17 feet 11 inches. They are very irregular as to size. Some go through and through the buildings, others are back to back. Two of them have no windows; eleven rooms have only one small window per room, and the remainder have, some two, others three windows, but none more than three.

The total accommodation is intended for 160 men, with an amount of space varying from 228 to somewhat over 600 cubic feet per man.

The following table gives the details of the accommodation per each room :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A. 1, 2, 3 - | 21 | 15 | 6 |
| B. 1 - - | 4 | 4 | — |
| | 5 | 2 | 3 |
| B. 2 - - | 4 | 4 | — |
| | 12 | 6 | 6 |
| B. 3 - - | 4 | 4 | — |
| | 12 | 6 | 6 |
| B. 6, 7, 8 - | 15 | 12 | 3 |
| C. 1 - - | 4 | 4 | — |
| C. 2 - - | 4 | 4 | — |
| | 16 | 6 | 10 |
| C. 3 - - | 4 | 4 | — |
| | 16 | 6 | 10 |
| D. 1, 2, 3 - | 12 | 12 | — |
| D. 6 - - | 4 | 4 | — |
| | 5 | 2 | 3 |
| D. 7 - - | 4 | 4 | — |
| | 5 | 2 | 3 |
| D. 8 - - | 4 | 4 | — |
| | 5 | 2 | 3 |
| Total - | 160 | 107 | 53 |

The present regulation number of men in the fort is 33 per cent. in excess of the accommodation at 600 cubic feet per man. Some rooms are much more crowded than others. One 16-men room affords only 245 cubic feet per man.

As a whole the rooms are of a very inferior description, and most of them are far from being comfortable.

There is some provision for ventilation by means of hollow beams carried across the ceilings, with openings at intervals, but the beams are scarcely sufficient for renewing the air. We would propose to supply each room with a ventilating shaft and inlet of the usual construction, and to place a ventilating fire-grate in all the larger rooms. One barrack-room is used as a school-room, and requires ventilation like the other rooms. Each staircase should likewise be ventilated by a louvred shaft carried above the roof.

The rooms are lighted at night by candles. Gas is not obtainable.

There is an ablution-room with the usual fittings, and a bath recently put up in one of the casemates.

There is no day-room and no library.

The women's wash-house is very deficient in requisites for washing. It should have fixed tubs, gratings, and means of drying linen.

The cook-house has boilers, and there is a sufficient oven in another apartment.

Water is brought by pipes into the fort from a distance of 1½ miles. It is stated to be good, and abundant in quantity.

A great defect in these barracks is the state of the drainage. There is a single untrapped gulley which receives all the surface and other water and communicates with a cesspit in the ditch, the overflow from which passes away by a rubble drain to the sea. The plan is a very old and bad one. The drains are liable to constant obstruction, and while we were at the fort the whole of them were being opened to remove the deposit, which was simply thrown into the ditch, where it would be allowed to dry. The whole system requires to be remodelled. The ground and buildings inside the fort should be drained, and the sewage carried across the ditch by means of an iron pipe to the point of discharge into the sea.

The latrines within the fort are of the usual construction, but they are intended only for night use. There is a latrine for the day time outside the fort. Those within are emptied by contract. Both sets should be remodelled on Macfarlane's plan, and their contents flushed out daily.

There is no separate accommodation for married non-commissioned officers and soldiers; except such as is afforded by some very inferior attics. When the barracks are not full temporary accommodation is found in some of the vacant barrack-rooms. The rooms, such as they are, should have Arnott's ventilators put into the chimney breasts.

The guard-room is under the archway at the gate. It is very dark, and requires ventilation by a shaft and remodelled grate.

The fort is practically a long way from any town or village, and the men are said to have no sufficient means of occupation or amusement, especially during long winter nights. A library and reading-room are urgently required.

*The Sanitary Improvements required are as follow:—*

1. Reduction of the inmates in each barrack-room to the extent shown in the table.

2. Ventilation of each barrack-room and the school-room by a shaft and inlet. Remodelled fire-grates to be put into the larger rooms. Stairs to be ventilated by shafts through the ceiling and roof. Guard-room to be ventilated by a shaft and remodelled grate. Non-commissioned officers' rooms to be ventilated by Arnott's valves.

3. Women's wash-house to have fixed tubs, gratings, and means of drying linen.

4. Fort to be drained to the sea. Privies to be converted into water latrines, and flushed out daily.

5. A library and reading-room to be provided.

### *Landguard Fort Hospital.*

The hospital consists of three rooms at the end of the barrack range. It was unoccupied at the time of our inspection. Two of the rooms are only 7 feet 6 inches in height, and the other is 8 feet 6

inches high. The following is the accommodation for sick :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 600 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| No. 1 | 4 | 1 | 3 |
| „ 2 | 6 | 3 | 3 |
| „ 3 | Occupied by Hospital Attendant. | — | — |
| Total | 10 | 4 | 6 |

This building should certainly not be appropriated for more than four sick. It has none of the attributes of an hospital. Ward No. 1 is occupied by the hospital attendant, and serves at the same time as the hospital kitchen. It is on the ground floor ; above it are the other wards, one of which is an attic. There is no accommodation for sick except the rooms and the beds. There is no water-closet, no means of ablution or of bathing, no suitable accommodation for attendants, no drainage, all the refuse water has to be carried away by hand, no water supply, no provision nor pack store, and, as already stated, there is no separate kitchen. Where the space is so restricted as it is in this instance it is simply impossible to provide the requisite accommodation for sick. If the barracks were fully occupied, and the troops had 10 per cent. sick, which is the usual hospital provision, the overcrowding would be excessive. But we were informed that on account of the healthy nature of the site very few men are ill.

We should propose simply to make the best of the case by improving the present accommodation, *and with this view we would recommend as follows:—*

1. Each ward to be ventilated by a shaft and inlet. A remodelled grate for each ward to be provided. Stair to be ventilated through the roof.

2. A water-closet with space for a bath and for an ablution table to be constructed, or if this be impracticable, the present hospital privy to be converted into a water-closet, and drained into the proposed system of barrack drainage.

3. Water to be laid on, the hospital to be drained, and a trapped sink to be provided for waste water.

### 3. The Redoubt, Harwich.

This redoubt is circular in form, and is situated on a rising ground south of Harwich. It consists of a series of elliptical casemates surrounding a circular court or well. Above the casemates are the guns. The whole structure, which is of solid masonry, is buried in the mass of the hill almost to the embrasures, and is separated from the hill all round by a deep ditch, of which the outer wall of the casemates forms the interior line. The bottom of the ditch is drained. Although, therefore, the works are protected by the hill all round, they are completely detached from the earth, and not affected by damp from it.

There are in all 18 casemates, 8 of which only are used as men's rooms. The remainder are occupied as officers' quarters, cook-house, stores, guard-room, sick-room, &c. &c. The present regulation accommodation is for 118 men, with about 471 cubic feet per man.

The following table gives the details :—

| Casemates. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| No. 1 | 16 | 12 | 4 |
| „ 2 | 12 | 9 | 3 |
| „ 3 | 16 | 12 | 4 |
| „ 5 | 16 | 12 | 4 |
| „ 11 | 15 | 12 | 3 |
| „ 12 | 12 | 9 | 3 |
| „ 13 | 15 | 12 | 3 |
| „ 15 | 16 | 12 | 4 |
| Total - - | 118 | 90 | 28 |

These eight casemates would contain 90 men at a little more than 600 cubic feet per man.

These casemates have means of ventilation at both ends. It would improve them very much to introduce remodelled grates.

The sick-room was unoccupied at the time of our inspection. It is not fit for any hospital purpose, except on emergency, and the hospital at Landguard Fort is separated from the redoubt by the estuary of Harwich harbour. If the redoubt were to be occupied permanently, it might be well to provide some place in the neighbourhood in which sick could be treated.

There is an ablution and bath-room, and the kitchen is supplied with an oven.

There are two sets of privies. One outside the fort, on the edge of the glacis, consists of a temporary wooden structure, very foul and offensive. Within the fort some iron pans are placed in a casemate for privies. It would be a much better plan to convert both privies into water latrines. An iron pipe carried across the ditch would enable this to be done. It is most desirable in such a structure as this, placed as it is below the ground, to provide for the direct removal of every matter likely to become injurious to health.

*We would recommend as follows:—*

1. Reduction of the number of inmates to give 600 cubic feet in each casemate.

2. Converting the privies into water latrines.

### 4. Yarmouth Arsenal Barrack.

Part of this barrack was not originally constructed for its present object. It was erected in 1808 for ordnance stores, and was converted into temporary barracks in 1855. It is situated on the west side of Yarmouth harbour, at some distance from its mouth, and within a few yards of the water. There is, indeed, only a narrow quay between one of the barrack gates and the river. The distance in a straight line to the sea is about half a mile. The area of ground is 4 A. 0 R. $1\frac{1}{4}$ P., two acres of which are occupied by the barrack buildings. The parade ground is about level with high-water mark. The subsoil is sandy, and the district within which the barrack is situated is damp, and its population suffers from ague. It was stated to us that fever and rheumatism had occurred in two successive occupants of a single officer's quarter, which was unoccupied in consequence at the time we were there. At the date of our inquiry 18 men of the troops in occupation were in hospital, six of whom were reported to be suffering from intermittent fever. Taken as a whole, the site is far from being a healthy one, and is only fit for occupation on an emergency. If there be no urgent military reasons for retaining possession of it, we can safely say that the ground and buildings would be much better suited for other purposes than as a permanent barrack for troops.

We shall, however, deal with the barrack as it is, with the view of improving its sanitary condition as far as it may be practicable to do so. The local position does not, of course, admit of improvement, but in

some points the buildings could be rendered more healthy.

The buildings occupied by men consist of a large central block, formerly an armoury, and of two side blocks built at right angles to it. These three blocks enclose the parade ground on three sides, the fourth side being formed by a high wall and gate, outside which is the quay and harbour already mentioned.

On the side of the armoury opposite the barrack square there is another smaller square, of which the sides are formed by the armoury, officers' quarters, kitchens, guard-room, offices, &c.

At one end of the armoury, and behind the line of the barrack ranges, is a small enclosed square of one-story buildings, in which there are three 25-men rooms, a serjeants' mess, kitchen, and store-room. The men's rooms have windows on one side only; they are low, and imperfectly ventilated. There is a corresponding square on the opposite side, also containing three 25-men rooms of the same description, together with the school, &c.

There is a scattered neighbourhood occupied by timber yards, dwelling houses, and other buildings outside the boundary. The position is tolerably open, but on account of its being low the barrack-rooms have not the benefit of a good external ventilation. The barrack enclosure is simply a wooden fence.

There are altogether 16 men's rooms and 55 non-commissioned officers' rooms on the construction, and there is regulation space for 430 non-commissioned officers and men, at from 350 to 939 cubic feet per man.

The following table gives the details for each room :—

| Barrack-rooms. | Present Regulation Number of Men. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| C. No. 1 | 25 | 21 | 4 |
| „ 2 | 25 | 25 | — |
| D. „ 1 | 25 | 21 | 4 |
| „ 2 | 25 | 25 | — |
| E. „ 1 | 25 | 22 | 3 |
| „ 2 | 25 | 25 | — |
| F. „ 1 | 25 | 21 | 4 |
| „ 2 | 25 | 25 | — |
| G. „ 1 | 32 | 32 | — |
| „ 2 | 28 | 28 | — |
| H. | 25 | 14 | 11 |
| I. | 25 | 14 | 11 |
| K. | 25 | 14 | 11 |
| L. | 25 | 14 | 11 |
| N. | 25 | 14 | 11 |
| P. | 25 | 14 | 11 |
| Total 16 | 410 | 329 | 81 |

These rooms, it will be observed, consist of two groups, in one of which there is little or no deficiency, while in the other group the deficiency of space is very considerable. The rooms H to P have regulation space for 150 men, where no more than 84 men ought to be placed, while the group C to H have regulation space for 260 men, with an apparent deficiency of accommodation for no more than 55 men. All the rooms in this group except four would accommodate more than their number at 600 cubic feet per man, so that in these rooms there is an apparent excess of space, but the excess is only apparent, on account of the unusual height of the rooms, and as height by itself does not fulfil all the conditions required by increased cubic space, we are of opinion that no more men should be placed in these rooms than the numbers given in the table. The four rooms C 1, D 1, E 1, and F 1, in which the space falls below 600 feet per man are from 11 feet to 11 feet 4 inches high, while all the rooms in which the table shows no deficiency of accommodation are from 16 feet 6 to 17 feet 4 inches high, the space being hence above the beds rather than around them. This arises from the circumstance that some of the rooms, as, for instance, those in the armoury, are more lofty in the side walls than barrack-rooms generally are, while nearly all of the lofty rooms want ceilings, and have the space which ought to be above the ceiling taken into them.

The rooms H to P are 10 feet 3 inches high. The rooms in the barrack-houses, C to G, are from 49 feet 5 inches to 49 feet 10 inches long, and from 23 feet 10 inches to 30 feet 8 inches wide. The remaining rooms are a little over 41 feet long, and about 21 feet wide.

By far the best men's rooms in this barrack are those in the armoury. They are spacious and well-lighted, and have a sufficiency of windows on opposite sides.

The rooms in the houses along the sides of the parade ground are by no means so good, and they have windows only on one side. The newer rooms in the small squares are also of an inferior description. Until recently, several rooms were used as a hospital, for which purpose they were totally unfit. They have very properly been abandoned, and the sick are now received into the general hospital, where wards have been given over for the purpose. The former hospital is now used as married quarters. The general construction of the men's rooms along the sides is not good. They are imperfectly lighted; the stairs in some of them pass directly from the rooms below to the rooms above, so that the foul air can enter the upper rooms. The rooms on the ground floor are not sufficiently raised above the ground to admit of that free ventilation required between the ground and flooring in all barracks built in districts where malaria exists.

All the rooms are imperfectly ventilated. Eight of the 25-men rooms have air bricks in the walls, but no shafts. Six 25-men rooms have two perforated zinc ventilators each. Two rooms, those in the armoury, are not ventilated. The upper rooms in all the barrack-houses are cold from want of ceilings. They have the usual regulation grate, which is insufficient for warming them at present. Wherever practicable, additional light should be given to the darker barrack-rooms, by windows in the blank walls. All the upper rooms should be ceiled. Ventilation should be provided by shafts of the usual construction, carried above the roof, and the inlets should be improved on the principles we have adopted in other barracks;—by the area of the inlets being enlarged to afford the requisite amount of air, and also by providing means for diffusing the inflowing current. All the fire-grates should be remodelled, to heat part of the air admitted.

The staircases which open into the upper rooms should be boxed off, and carried up to the roof, with a ventilating skylight above.

The serjeants' rooms are supplied with inlets for air, but should have Arnott's valves introduced into the chimneys.

The barrack-rooms are lighted with candles, and the exterior with lamps. Gas can be obtained, and should be supplied.

There are two school-rooms, one for adults and one for children. There is a library, and also a reading-room. They are tolerable rooms, except that one of the school-rooms is deficient in window-light. They all require ventilation, warming, and lighting, like the barrack-rooms.

There is no day-room, cleaning-room, nor drill shed. The only workshop is a small one for tailors at the end of one of the barrack-rooms. It is inconveniently situated, and unventilated.

This barrack has an excellent ablution-room on one side the square. It has 25 fixed enamelled basins, with water taps to each, and a copper boiler with pipes for supplying warm water. It is one of the

most complete ablution-rooms we have seen, but would afford only about half the ablution accommodation required if the barracks were fully occupied. A similar ablution-room for the opposite side of the square would supply the deficiency. There are no baths ; four would be sufficient for the full strength.

Behind the east side of the barrack there has been recently erected the most complete small barrack wash-house we have anywhere met with. It is a lofty, light, spacious, and well-ventilated room, supplied with fixed tubs, gratings, boilers, and water laid on. Behind the range of boilers is a drying-closet, heated by the waste heat of the boiler-fires. This wash-house affords every required convenience for ordinary barrack washing. There is a cook-house with seven boilers and an oven. It requires ridge ventilation by louvres. Another cook-house is required for the opposite side of the square.

Water is derived partly from the water company's mains and partly from rain water collected on the roofs. There is a fire-tank capable of holding 25,000 gallons.

The latrine accommodation is imperfect. It consists of a deep trough, with means of flushing out the soil. There are divisions of corrugated iron between the seats. There is no separate accommodation for women, who are merely divided from the men by a corrugated iron bulkhead. The whole arrangement, although recently constructed, is offensive and noisome. Macfarlane's latrines should be substituted for those now in use, and a better form of urinal outside the latrine buildings should be provided. Separate latrine accommodation for women and children is also required.

The present guard-room and lock-up room are very small, insufficient, and inconveniently placed. The officers' mess, which adjoins them, has no anteroom, and no messman's room, nor pantry. It is stated that by a re-arrangement of existing buildings an anteroom could be provided, and the guard-room removed to a better position.

There is no canteen and no ball-court ; but there is plenty of vacant ground on which to place them.

Both officers' quarters and barrack stores are deficient.

This barrack is deficient in so many points that considerable outlay will be required to improve and complete it. On the other hand the site is not a healthy one; and, no doubt, were it deemed necessary to build a new barrack a much better site could be obtained. The alternatives presented are, therefore, either to build a new barrack or to improve the present one as far as possible. Should it be considered advisable to adopt the latter alternative, *we would recommend as follows* :—

1. That the number of men per room be allotted in conformity with the table, subject to any further reduction in numbers which may be required to give 600 cubic feet per man when the rooms are ceiled.

2. That ceilings be provided for the rooms requiring them.

3. That shafts, inlets, and remodelled fire-grates, of the usual construction and ventilating area be provided for all the barrack-rooms, school-rooms, library, and reading-rooms. Tailors' shop to be ventilated by a shaft and inlet.

4. That in rooms with windows on one side only, windows be provided on the opposite side where practicable.

5. That the staircases terminating in upper rooms be continued to the roof, and lighted and ventilated above.

6. Arnott's valves to be introduced into the serjeants' rooms.

7. The barracks to be lighted with gas.

8. Additional ablution-room and four baths to be provided.

9. Additional cook-house to be provided.

10. Latrines to be reconstructed on Macfarlane's principle, and properly supplied with water. Urinals to be reconstructed outside the latrines. Water latrines to be provided for women and children.

11. A suitable guard-room and lock-up room to be provided, and supplied with shafts and remodelled grate for ventilation and warming.

12. Officers' quarters and mess establishment to be improved as suggested. Canteen and ball court to be provided. Stores to be extended. Day-room, cleaning-room, and drill-shed to be provided. Barrack ground to have a proper enclosure.

*General Hospital, Yarmouth.*

This hospital belongs to the Royal Navy, but is at present occupied by the Army as an invalid establishment for men arriving in ill-health from foreign service. Recently, on account of the hospital accommodation at Yarmouth barracks being quite unfit for sick, several wards have been set apart as a regimental hospital, and were occupied as such at the time of our inspection.

The total area within the hospital enclosure is about nine and a half acres. It is a parallelogram, with the hospital at one end of it. The governor's house and medical officers' quarters are in two buildings, placed on opposite sides of the other end of the ground.

The site is on a sandy subsoil close to the sea, at a short distance from the built part of the town. It is open, airy, and healthy. Although the climate is cold during east and north-east winds, it is said to be well adapted for invalids, who recover rapidly.

The hospital consists of four pavilions arranged in square with the angles open.

Each pavilion is 260 feet long, and two stories high. Three of the pavilions are used for sick men, and the fourth pavilion is intended for sick officers, stores, &c. Each pavilion contains eight wards, four on each floor, with a spacious staircase carried up between them. The chapel, operating theatre, surgery, &c. are placed in the centre of the length of the pavilions.

All the entrances to the wards are connected by an open corridor one story in height, which is carried round the ground floor, and encloses the inner court of the hospital. This court is used partly as a garden, and partly as an exercising ground. The building affords an illustration of a good ground plan, and taken altogether this is perhaps the best hospital in the United Kingdom.

There are 25 wards occupied by sick and invalids at the present time. Twenty-one of these are from 42 to 43 feet in length ; one ward is 40 feet 9 inches long ; two are between 22 and 24 feet long ; one is 14½ feet long. Nearly all are from 23 to 24 feet wide, and they vary in height from 13 feet 9 inches to 14 feet.

Each ward, except those of the smallest size, has from 9 to 10 windows arranged on opposite sides of the ward, and they have each one fireplace.

The wards were originally intended for 14 beds each, but recently the number of beds has been reduced to 12 in each of the larger wards, in order to raise the cubic space as near as possible to that required by the new medical regulations, and it ranges from 1,124 to 1,230 cubic feet per bed. The total present accommodation in the occupied wards is for 276 beds.

None of the wards are ventilated, except by door, windows, and fireplaces. The lower wards have an opening over the door into the passage, but it is of very little use.

There is sufficient space for non-commissioned officers.

The wards enter right and left out of the passages, and between each pair of wards, on both floors, are two nurses' rooms, 9 feet 9 inches long by 8 feet broad and 14 feet high. One of these rooms is attached to each ward. Between each pair of nurses' rooms are the water-closets.

The hospital is lighted with gas, and there are stoves in the passages for warming.

There are lavatories and bath-rooms away from the wards, and not conveniently situated for sick and ailing men.

There is an ample water supply from four wells by means of pumps. The water is stated by the medical officer to be good.

In a small court in front of the main entrance to the hospital is a row of one-story shed buildings, one of which is used as a kitchen. It is insufficient for its purpose, and a plan has been submitted for improving it.

The buildings are drained into the yard.

There is ample space for stores.

By altering the arrangement of the interior, in which there is at present much lost space, this hospital might be made an excellent establishment, in every way adapted for its object, while the accommodation might be materially increased. It would be quite worth while to do this if the building were permanently taken over by the War Office.

As a place for invalids arriving from warm climates, the situation is very good. There are excellent piers by which sick could be landed. It is, in short, just the kind of establishment required for invalids, the best proof of which is the rapidity with which the health of such invalids is benefited after arrival.

The wards in their present state require ventilation by shafts, inlets, and remodelled grates. The staircases should have moveable glass louvres in the upper panes of the windows. The kitchen also requires improvement. Bathing and ablution accommodation should be provided nearer the wards ; and, lastly, all the nurses' rooms should have Arnott's ventilators in the chimneys.

Ventilation of wards, &c., and improvements in the kitchen might be carried out at once. But further alterations, if considered advisable, should be undertaken with reference to a general re-arrangement of the interior of the building.

### 5. Norwich Cavalry Barrack.

Norwich cavalry barrack is situated within a spacious enclosure on the north-east side of the city. It is in the suburbs, and has few houses near it. The ground slopes from a height behind the barracks towards the river Wensum, which passes in front of the entrance gate, and the buildings and the parade ground are both situated on the slope. The fall is so considerable at one end of the ground that a block of stables and men's rooms in that situation has been raised on arches to bring them to the level. The subsoil is sandy, and the means of natural drainage are ample.

The barracks are arranged in blocks. Three of these, the centre one being officers' quarters, extend in line along the higher end of the ground, which has been partly excavated to find a level line on which to place them. Another block, already mentioned, of stables and men's rooms raised on arches is placed at right angles to the main line at one end. Opposite this block a riding school has been recently erected. The whole forming three sides of a long parallelogram, with the angles open. Further down the slope, below the riding school, is the hospital ; and close to the lower enclosure wall are the guard-room, cells, canteen, &c.

So far as regards situation and general arrangement of the buildings, there is nothing objectionable, always provided that advantage were taken of the facilities afforded by the ground for draining it efficiently ; but, apart from the situation, the barrack is not a good one. All the blocks have stables with men's rooms over them, and the objectionable internal corridor for access. The rooms are mostly low and gloomy ; the internal corridors dark, and without proper ventilation ; the paving outside the buildings is rough and bad ; the parade ground is much cut up, and not in good condition ; and the barrack generally has an appearance of disrepair about it.

One of the blocks, that nearest the riding school, differs in some respects from the other two. It is of more recent construction, having been rebuilt after a fire. It has better windows, and the rooms are on the whole better than those in the older parts of the barrack.

The rooms in the west wing are all of a size. Each room is 28 feet long, 16 feet wide, and 8 feet 4 inches high. Those in the right wing are all 16 feet wide and 7 feet 11 inches high, and, with the exception of two 15 feet rooms, they are all 28 feet long. The left-wing rooms (those of most recent erection) are 16 feet wide and 9 feet 8 inches high. Ten of them are 28 feet long, and six are 17 feet 6 inches long.

These barracks are intended to accommodate 248 men and 266 horses. The cubic space per man varies from 443 to 541 feet, with the exception of six small rooms containing 24 men, in which the space is 676 cubic feet. These small rooms, although placed on the return as men's rooms, were occupied by non-commissioned officers.

The following table gives the details of accommodation :—

| Rooms. | Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| West Wing : | | | |
| No. 3 | 8 | 6 | 2 |
| „ 4 | 8 | 6 | 2 |
| „ 5 | 8 | 6 | 2 |
| „ 6 | 8 | 6 | 2 |
| „ 7 | 8 | 6 | 2 |
| „ 8 | 8 | 6 | 2 |
| Right Wing : | | | |
| No. 3 | 4 | 3 | 1 |
| „ 4 | 4 | 3 | 1 |
| „ 5 | 4 | 3 | 1 |
| „ 6 | 4 | 3 | 1 |
| „ 7 | 8 | 6 | 2 |
| „ 8 | 8 | 6 | 2 |
| „ 9 | 8 | 6 | 2 |
| „ 10 | 8 | 6 | 2 |
| „ 11 | 8 | 6 | 2 |
| „ 12 | 8 | 6 | 2 |
| „ 13 | 8 | 6 | 2 |
| „ 14 | 8 | 6 | 2 |
| „ 15 | 8 | 6 | 2 |
| „ 16 | 8 | 6 | 2 |
| Left Wing : | | | |
| No. 1 | 4 | 4 | — |
| „ 2 | 4 | 4 | — |
| „ 3 | 4 | 4 | — |
| „ 4 | 4 | 4 | — |
| „ 5 | 4 | 4 | — |
| „ 6 | 4 | 4 | — |
| „ 7 | 8 | 7 | 1 |
| „ 8 | 8 | 7 | 1 |
| „ 9 | 8 | 7 | 1 |
| „ 10 | 8 | 7 | 1 |
| „ 11 | 8 | 7 | 1 |
| „ 12 | 8 | 7 | 1 |
| „ 13 | 8 | 7 | 1 |
| „ 14 | 8 | 7 | 1 |
| „ 15 | 8 | 7 | 1 |
| „ 16 | 8 | 7 | 1 |
| Total - 36 | 248 | 202 | 46 |

If all the barrack-rooms were occupied by men, there would be space for 202 men instead of 248. If, however, we deduct the accommodation in the 10 small rooms, which are in reality necessary for non-commissioned officers, the regulation accommodation for men will be 208, while the accommodation at 600 cubic feet per man will be sufficient for no more than

166 men, showing a deficiency of accommodation for 36 men.

It will be necessary to reduce the number of men per room from eight to six in all the eight-men rooms in the west and right wings, and from eight to seven in those of the left wing.

The whole of the rooms and corridors require ventilation.

The corridor of the west-wing range requires a plastered shaft the whole width of it, to be carried from its ceiling above the roof, to be covered above by a large ventilating skylight.

The right wing corridor has plastered shafts, but the ventilation by them is not sufficient, and requires to be increased at the skylights. The left wing requires similar shafts to be carried up at all the existing skylights over the corridor. Care should be taken to provide ample means of renewing the air at each skylight.

Every barrack-room should be separately ventilated by a shaft, inlet, and remodelled grate of the usual construction.

All the stables require ventilation by shafts carried from the corners above the ceilings.

The barracks are lighted with candles, although gas can be readily obtained.

There is a small school-room, and also a small library, both of which require ventilation like the barrack-rooms. There is no day-room.

The right and left wings have each a cook-house outside the buildings. One of them belonging to the right wing has boilers and an oven. The left wing cook-house has no oven. It ought to be supplied with one, as the existing oven is too far away from the men's rooms.

We are informed that before the oven was put up the men used to send their dinners to be cooked outside, at the cost of their vegetables.

Over the right wing kitchen is an ablution-room of recent construction, and entered from the stair leading down to the kitchen. This room is supplied with tables without ledges, and it has no ventilation. There is one bath. Beneath the stair is a dark passage and store, both very noisome, and such as ought not to exist in any barrack range. There was filth of the most offensive description in this passage at the time we were there.

The stairs leading down to the kitchens constitute the ventilating shafts of the kitchens, and convey damp foul air directly into the corridors, out of which the men's rooms are entered. To obviate this as far as practicable, the kitchens and staircases should be thoroughly ventilated, and a swing door should be placed at the entrance to the kitchen.

The water supply is derived from pumps, and also from a tank for storing rain water, If pipe-water can be obtained, it would be much better to lay it on.

One great defect in this barrack is the want of a proper system of drainage. It is true that there is the usual provision for removing surface water, but all the filth is retained in cesspits.

The privies are mere troughs, without proper drainage. In their present state they are too near the men's rooms to be safe.

These privies are in urgent need of improvement. They should be reconstructed on Macfarlane's principle, and their contents discharged into a cart for removal, in the manner adopted in Glasgow barracks, unless an outlet for the drainage can be obtained. In whatever way the sewage is disposed of, all the present cesspits should be abolished. The new latrines should be provided with divisions, half-doors, light, and ventilation.

There is a large wash-house in the arches under the west wing. It requires the usual fittings, and a drying closet.

At the end of this wing there is a manure pit close under the men's rooms. It should be reconstructed at a greater distance; raised above the ground, and the floor of it paved and drained.

There are no litter sheds connected with any of the ranges.

There is no shed for drill or exercise in wet weather, and no ball court.

The only accommodation for trades consists of two small rooms entered from the same corridor giving entrance to the men's rooms.

There are six cleaning-rooms, also off the corridors.

There is no accommodation for the families of married soldiers; but when the barracks are not fully occupied, they are permitted to use vacant rooms.

The best part of the barrack is an excellent new riding-school, which, however, requires ventilation through the roof.

There is a good serjeants' mess and kitchen at the end of the left wing.

The guard-room is tolerably good, and has a verandah. It requires the usual ventilation by a shaft and remodelled grate. There is no lock-up. There are three rather small cells entering from a passage beside the guard-room. They are defectively ventilated, and require shafts for the purpose.

The canteen is good and sufficient, but the tap-room requires an Arnott's ventilator and perforated panes.

Norwich barrack, as a whole, is far from being complete. Its defects are of the same general character as those of Ipswich barrack. After all that can be done for them the rooms in neither barrack will be good. It is therefore worthy of consideration whether these rooms might not be reconstructed on the plan of Hilsea barrack, which has been proposed to us for adoption in such barracks as those at Norwich and Ipswich. The rooms in Hilsea barracks go through and through the block, and are entered from an open outside corridor. The plan answers tolerably well in this instance. The distance between the opposite windows is 40 feet, and the rooms are 10 feet 7 inches in height, which is much higher than those at either Ipswich or Norwich. If with their present height the corridors were removed, and the rooms carried right across the ranges, there would be thorough ventilation; but the ceilings would be very low in proportion to the other dimensions of the rooms. To make the rooms what they should be, it would be necessary to raise the ceilings from two to three feet, to make them all at least 11 feet high, and to provide a sufficient number of properly hung windows. If this were done, and an outside corridor provided for entrance, both barracks would be very much improved, and rendered both more comfortable and more healthy.

In so far as regards the present buildings of Norwich barracks, *we would recommend as follows*:—

1. That the number of men in each room be reduced to the extent shown in the preceding table.
2. That the corridors be lighted and ventilated by square shafts, and ventilating skylights to the extent stated above.
3. That each room be ventilated by a shaft carried above the roof, and by an inlet, and remodelled grate.
4. Each stable to be ventilated by a shaft carried up from each corner above the roof.
5. The school-room, library, and workshops to be ventilated like the barrack-rooms.
6. The riding-school to be ventilated at the ridge.
7. The guard room to be ventilated by a shaft and remodelled grate, and the cells and passage to be ventilated by shafts.
8. Canteen tap-room to have an Arnott's valve and perforated panes for ventilation.
9. Cook-houses to be ventilated by shafts through the roof, and to have swing doors to the stairs leading up to the corridors. An additional oven to be provided.
10. Ablution-room to have a bead to the table, and to be ventilated.
11. Barrack to be drained to an outlet; all cesspits to be abolished; all privies to be reconstructed as

water latrines, and to have divisions of seats, half-doors, and light and ventilation. To be drained to an outlet, or their contents to be flushed into a water-tight cart, and removed once or twice a day.

12. Manure pits to be removed away from the vicinity of the men's rooms, and to be raised above the ground, paved, and drained.

13. Wash-house to be properly fitted up, and to have a drying closet.

14. Litter sheds to be provided.

15. Covered drill or exercising ground and a ball court to be provided.

*Norwich Cavalry Hospital.*

This hospital is constructed like an ordinary village house. It is two stories in height, with a passage and staircase in the middle, and wards and offices opening right and left out of them. It is situated between the end of the new riding-school and the lower boundary wall of the enclosure. It is open to the parade ground in front, and under one of its end walls an exercising ground for horses was being completed at the time we were there. We have had occasion in previous reports to point out similar gratuitous injury inflicted on hospitals by mere want of consideration. There is abundance of space for exercising horses within the barrack enclosure, and quite away from the hospital, and yet the exercising ground has been formed perhaps on the only spot of ground where it should on no account have been placed.

Of course either the exercising ground or the hospital must be removed.

The interior of the hospital is arranged in the usual manner. On either side the entrance there is the kitchen and serjeants' room, and beyond these is one small ward and the surgery. The floor of the ward is below the level of the ground. Half way up the staircase, out of the first landing, are two badly ventilated water-closets. On the upper floor are two small wards, and one large one extending the length of the front of the building.

In a small yard behind there is a small lean-to building, and a badly constructed privy.

The sick wards contain regulation space for 25 beds, at from 390 to 397 cubic feet per bed, exhibiting the maximum degree of overcrowding we have anywhere met with in hospitals.

The ground floor ward is 15 feet long by 13 feet 2 inches wide, and 9 feet 10 inches high. The large up-stairs ward is 37 feet 10 inches long, 17 feet wide, and 9 feet 2 inches high. The other two wards have the same height, and are each 15 feet 8 inches long by 13 feet 9 inches wide.

The following table shows the present accommodation in these wards, in contrast with what it ought to be, at 1,200 cubic feet per bed :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 5 | 1 | 4 |
| 2 | 5 | 1 | 4 |
| 3 | 10 | 5 | 5 |
| 4 | 5 | 1 | 4 |
| Total - | 25 | 8 | 17 |

The three smaller wards have each of them only 1,950 cubic feet of contents, an allowance too small for a single sick man in one small room. In such rooms the difficulty of ventilation is much greater than in large wards, and a much larger comparative amount of space is required.

None of the wards are ventilated. The only substitute for ventilation are openings over the doors into the passages, whereby the foul air of all parts of the building is permitted freely to distribute itself among the sick.

The wards require shafts, inlets, and remodelled grates, to renew and warm the air. The staircase should have a shaft carried through the roof, and perforated glass panes in the windows. As the kitchen is under one of the wards, it likewise requires a shaft to carry off the fumes of cooking.

There is no separate accommodation for orderlies, who have hence to sleep in the overcrowded wards among the sick.

Ordinary tallow candles are used for lighting. Ventilating gas-burners should be introduced into the wards and offices.

There is no proper lavatory and bath-room. Out of the kitchen there is a small scullery 3 feet 9 inches wide and 14 feet long, where washing up is done, and where the sick wash themselves in metal basins. There is no bath, except the ordinary slipper bath.

Water is derived from a pump in front of the hospital; and all the hospital drainage from privy, water-closets, slops, &c., flows into cesspits behind the hospital, and at no great distance from the well. There is an overflow pipe from the cesspits into the river, to give egress to the superfluous sewage which cannot escape into the subsoil.

Of course the fundamental remedy for these great defects is to drain the hospital, and to supply it with water along with the barracks.

The privy should be reconstructed as a water latrine.

A proper lavatory and bath-room, sunk basins, and a bath, with hot and cold water laid on, should also be provided.

There are no stores for either packs, provisions, bedding, clean linen or foul linen. There is only a cupboard under the stairs in which the packs are placed.

There is, of course, no accommodation for the sick of soldiers' families.

At the time the return was made to us there were no means of cooking diets except boiling. When roast meat was required it used to be prepared by the primitive expedient of thrusting a stick into the wall over the fire place, and attaching the meat to it by a worsted string. A proper oven has been recently provided.

It is difficult to deal with a building such as this, which is in reality a hospital only in name. By far the best thing to do would be to abandon the place altogether, and to build a proper hospital for the requisite number of beds.

If Norwich barrack is to be retained we should certainly advise this to be done.

*The present Building requires the following Improvements :—*

1. The number of beds to be reduced from 25 to 8 and the hospital to be extended, to afford space for 17 beds at 1,200 cubic feet each.

2. All the wards to be ventilated by shafts, inlets, and remodelled grates. Staircase to be ventilated by a shaft through the roof and perforated glass panes.

Kitchen to be ventilated by a shaft.

Water-closets to be thoroughly ventilated by shafts and inlets.

3. Hospital to be drained, and supplied with water along with the barrack; all cesspits to be cleaned out, filled up, and abolished. Privy to be converted into a water latrine.

4. Ablution and bath room, with sunk basins, a bath, and hot and cold water laid on, to be provided.

5. Gas to be laid on, and ventilated gas-burners introduced into the wards and offices.

6. Orderlies' room to be provided.

7. Stores to be provided.

8. Manège for horses to be removed away from the hospital. Earth to be dug away from the back of the hospital, and the ground to be lowered a foot below the level of the ground floor ward.

9. A proper enclosed exercising ground for convalescents to be provided.

A moment's consideration of the nature and cost of these improvements will show that a new hospital should be constructed with as little delay as possible, unless the station is to be given up.

### 6. Ipswich Cavalry Barrack.

This barrack is situated in an open, healthy position at the outskirts of the town of Ipswich.

It consists of a central block containing officers' quarters, and of two detached wings built at right angles to it, in which are the stables with soldiers' rooms over them. Between the line of the officers' quarters and the boundary wall is the riding-school, beside which are stores. On the same line, close to the boundary wall, is the hospital.

Down one side of the parade ground there is a row of workshops and other buildings, at the end of which, nearest the gate, is situated the guard-room and prison cells. The buildings are on the whole well arranged for external ventilation, except the hospital, which is in a corner, and in too close proximity to the stables.

The blocks containing men's rooms are of the usual construction of cavalry barracks. A long, dark, imperfectly ventilated inner passage extends the whole length of each block, out of which the rooms enter right and left. There is a window at each end of the passage in the east wing, but in the west wing both ends of the passage are blocked up by the school-room and barrack-serjeant's quarters, by which both light and ventilation are effectually cut off from the interior of the wing. There are two or three gratings in the ceiling of each passage corresponding to skylights in the roof of the attic. Access to the passage is obtained by two wooden staircases passing up between the stables.

There are 12 soldiers' rooms in one range and 10 in the other. They are all the same height, namely, 8 feet 1 inch, and they are all 16 feet wide. Four rooms are 21 feet 8 inches long. All the remaining rooms are 28 feet long.

None of them are very good rooms. They are too low in the ceiling. Seven of them have two windows each. The remaining 15 rooms have one window each.

The space per man varies from 452 to 459 cubic feet.

The following table gives the details :

| Rooms. | Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| East Wing : | | | |
| No. 1 | 6 | 5 | 1 |
| „ 2 | 8 | 6 | 2 |
| „ 3 | 8 | 6 | 2 |
| „ 4 | 8 | 6 | 2 |
| „ 5 | 6 | 5 | 1 |
| „ 6 | 8 | 6 | 2 |
| „ 7 | 8 | 6 | 2 |
| „ 8 | 8 | 6 | 2 |
| „ 9 | 8 | 6 | 2 |
| „ 10 | 8 | 6 | 2 |
| „ 11 | 8 | 6 | 2 |
| „ 12 | 8 | 6 | 2 |
| West Wing : | | | |
| No. 14 | 8 | 6 | 2 |
| „ 15 | 8 | 6 | 2 |
| „ 16 | 8 | 6 | 2 |
| „ 18 | 8 | 6 | 2 |
| „ 19 | 8 | 6 | 2 |
| „ 20 | 6 | 5 | 1 |
| „ 21 | 8 | 6 | 2 |
| „ 22 | 8 | 6 | 2 |
| „ 23 | 8 | 6 | 2 |
| „ 24 | 6 | 5 | 1 |
| Total 22 | 168 | 128 | 40 |

By removing two men out of each of the eight-men rooms, the remaining six men will have as nearly as may be 600 cubic feet per man, and by removing one man out of every six-men room the remaining five men will have less than 600 cubic feet each. If two men were removed there would be a considerable excess of space ; we have therefore left a man in each room instead of removing him. There are only four of these rooms altogether.

There are eight serjeants' rooms and two staff serjeants' rooms in the ranges, and several of the men's rooms are used as married quarters.

There are attics above the men's rooms, part of which are intended for occupation by men, but in their present state they are not adapted for such a purpose. The only ventilation for the barrack-rooms is by openings in the ceilings communicating with these attics. They are all warmed by the old pattern grate.

The main improvement required for these barrack-ranges is ventilation, beginning with the stables. From the four corners of each stable a shaft should be carried up above the roof to free the men's rooms as far as practicable from ammoniacal fumes and foul air.

Each room should also be ventilated by a shaft carried up from a corner of the ceiling opposite the fire-place to above the roof. One inlet for fresh air over the window will be sufficient. A remodelled fire-grate should also be introduced for warming part of the air.

The corridors should be lighted and ventilated by carrying up shafts the square of their breadth, through the attic to the roof. The shaft should be plastered inside, and should have a ventilating skylight in the roof at its upper end.

All the non-commissioned officers' rooms should have Arnott's valves and remodelled grates.

The barrack-rooms are lighted by candles at night, although there is gas laid on within the enclosure. All the rooms should have burners. There is a school-room, used also as a library. It requires ventilation in the same way as the barrack-rooms.

Along the wall at the rear of each wing are two shed ablution-rooms, 16 feet long and 9 feet wide. They have wooden washing benches, with beads, gratings, and pegs.

Recently, part of the ablution-room has been partially cut off from the remainder to accommodate a bath. The space is very restricted, and the division is not high enough. This division should be made more complete, and each ablution-room should have a louvre in the roof for ventilation. Each wing of the barracks is provided with a cookhouse and larder, opening out the passage at the foot of the stair leading up to the rooms. They are fitted up with the ordinary barrack boiler set in the usual way. One of them has a large brick oven for cooking rations. These cook-houses, being under the men's rooms, should each have a shaft carried from its ceiling above the roof, for ventilation.

Water is supplied partly from the company's mains, partly from pumps, of which there are four.

The pump water in two of the wells is apt to become scarce in dry weather. It is stated to be good, but the water which we ourselves examined, drawn from one of the pumps opposite the stables, was no better than diluted sewage, and quite unfit for any purpose whatever.

We need hardly repeat here, what we have often said before, as to the bad quality of the water drawn from superficial wells within undrained barrack enclosures. In porous soils the well becomes in fact the drainage outlet for the area, and all the impurities of the subsoil gravitate towards it.

The surface water is said to be removed by a barrel drain, but there is no drainage in the proper sense of the term.

The privies are of the usual barrack construction, connected with cesspits, which are cleansed occasion-

ally. There is only very limited privy accommodation for non-commissioned officers and soldiers, and none for women or children.

The accommodation requires to be extended, and the privies reconstructed as water latrines on Macfarlane's principle. They should have divisions and half-doors, and the buildings should be thoroughly lighted and ventilated. To enable these privies to be reconstructed there must be a drainage outlet. At present the surface drainage is passed into a millpond, and thence into the river Orwell; but, if the latrines were drained, some less exceptionable outlet would have to be provided, either directly into the river, or by the application of the sewage matter to agricultural purposes. If no such outlet be available, we would advise that a water-tight cart be provided, into which the latrine can be flushed, and the sewage carted away once or oftener every day. Behind the privies is a deep manure pit. This should be improved in the usual way, by raising it above the level of the ground, and paving and draining it.

There is a wash-house, but it is of little use, on account of the want of proper fittings. It requires fixed tubs, a drying closet, and roof ventilation.

The workshops, already referred to, consist of a master tailor's and tailors' shop, and shops for shoemakers, saddlers, and armourers. They appear to be sufficient and convenient, but require ventilation through the roof.

The riding-school is very low in the roof, although it has sufficient light and ventilation.

There is a good guard-room, but it requires ventilation by a shaft and remodelled grates. Adjoining the guard-room there are two cells, and there is another prison with four cells. One cell has about 1,200 cubic feet of contents, but all the others are much smaller; four of them have about 600 cubic feet each. They are all warmed and partly ventilated, but require more air within the passage.

The canteen is tolerably good, but the tap-room is rather dark, and requires an Arnott's valve and perforated panes for ventilation.

Ipswich barracks are deficient in the following points:—

There is no day-room, lock-up, cleaning-room, nor ball court. There are no litter sheds.

The magazine is close to the boundary wall and to dwelling-houses.

*The following are the Sanitary Improvements required:—*

1. Reduction of the numbers of men in each barrack-room to the extent shown in the preceding table.

2. Ventilation of each barrack-room by a shaft carried from the ceiling above the roof, and by an inlet and ventilating grate.

3. Obstructions at the ends of the corridor in the west wing to be removed, and windows to be opened at each end. Two shafts, plastered inside and covered with ventilating skylights, to be carried up in the length of each corridor.

4. Stables to be ventilated by a shaft carried from each corner above the roof.

5. Each cook-house to be ventilated by a shaft carried above the roof.

6. Ablution-rooms to have a louvre in the roof for ventilation. Bath to be better divided off from the ablution-room.

7. Gas to be laid on to the barrack-rooms.

8. Drainage to be improved. Privies to be reconstructed as water latrines, with divisions, half-doors, light, and ventilation. The sewage to be disposed of in one of the ways mentioned above. Latrine accommodation to be extended, and separate latrines for women and children to be provided. All cesspits to be cleaned out and abolished.

9. Manure and ash-pits to be raised above the level of the ground, and the surface paved and drained.

10. Women's wash-house to be properly fitted up and ventilated.

11. Workshops to be ventilated by shafts and inlets.

12. Guard-room to be ventilated by a shaft, and remodelled grate. Cells to be better ventilated, especially the passages. Guard-room privy to be made into a water latrine, and the cesspit abolished.

13. Canteen tap to have an Arnott's valve and perforated glass panes.

*Ipswich Cavalry Hospital.*

This is a small building, like a common village house. It has two floors, and a through-and-through flagged passage and a wooden staircase.

On the ground floor are the surgery, serjeants' room, kitchen, and one ward; and there are three wards on the floor above.

The upper wards are only 9 feet 5 inches high. The lower ward is 10 feet high. Three of the wards are 13 feet 3 inches wide and 17 feet long. The largest ward, which occupies the breadth of the hospital upstairs, is 37 feet 10 inches long and 17 feet wide.

The total accommodation is intended for 24 beds, at from 485 to 563 cubic feet per bed. There are 12 beds out of 24 with the smaller of these amounts.

The following table gives the details of the ward accommodation:—

| Wards. | Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| No. 2 | 4 | 2 | 2 |
| „ 5 | 4 | 2 | 2 |
| „ 6 | 12 | 5 | 7 |
| „ 8 | 4 | 2 | 2 |
| Total - | 24 | 11 | 13 |

None of the 11 beds we have given as the available accommodation at 1,200 cubic feet per bed have that amount of space. Properly speaking, the three smaller wards ought to hold one bed each, and no more; but we have placed two in each, on account of the small number, 11 beds, which the building would contain.

The wards are all very inferior in character. They are complained of as being cold and gusty, without being ventilated. The doors fit badly. The fire-grates are large and wasteful, and the building, as a whole, would be better adapted for married quarters, or for some similar purpose, than for its present object.

Besides reducing the number of beds, we would recommend that each ward be ventilated by a shaft, inlet, and remodelled fire-grate. The staircase should also be ventilated through the roof.

There is no accommodation for orderlies. Gas should be introduced to the wards and other rooms.

There is no ablution or bathing accommodation, except a slipper bath, kept in the dead house.

The wash-house requires a louvre in the roof.

The kitchen is properly a ward of the hospital. It is under a sick ward. It has defective means of cooking.

Water is laid on to the hospital from the town mains.

There is no drainage, all the waste water and all the refuse of privies and water-closets pass into cesspits, one of which is directly under the back wall of the hospital at the back door. This cesspit is only covered with boards within the privy, and has to be cleansed by raising the boards inside the privy. This work has only been recently done. A water-closet opening out of a gallery from the top flat has also recently been constructed; it discharges into the cesspit below. The ground floor wards are close to the cesspits.

There is neither pack store, provision store, nor bedding store. A four-bed ward is misappropriated as a pack store. There is no enclosure in front of the building. The only enclosed exercising ground is behind the hospital where the cesspits are.

If this hospital is to be used in future it must be drained and the cesspits abolished. The privies must also be converted into water latrines.

Such additional accommodation and conveniences as are required to make it suitable for its object ought to be provided; but it would be much better to build another hospital, and, after improving the sanitary condition of the building, to use the present one for increasing the barrack accommodation.

*The Sanitary Improvements immediately required are as follow:—*

1. Reduction of the number of beds to the extent shown in the table.
2. Ventilation of the wards by shafts, inlets, and remodelled grates; ventilation of the staircase through the roof; ventilation of the kitchen by a shaft; ventilation of the serjeants' room by an Arnott's valve.
3. Gas to be introduced.
4. Ablution and bath-room to be provided.
5. Wash-house to be ventilated.
6. Hospital to be drained along with the barrack. Cesspits to be abolished, and water latrines substituted for privies.
7. Additional stores to be provided.
8. An enclosure to be provided in front of the hospital.

July 1861. JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

The Right Hon. the Secretary of State for War.

# BIRMINGHAM DISTRICT.

SIR,

WE have the honour to transmit to you the following report on barracks and hospitals in Birmingham district, with the recommendations we have thought it necessary to make for improving their sanitary condition.

The barracks and hospitals we have examined in this district are:—

I. Birmingham cavalry.
II. Coventry. „
III. Northampton artillery.
IV. Weedon cavalry and infantry.

## I.—BIRMINGHAM.

### CAVALRY BARRACK.

This barrack is built on leasehold ground, about 16 years of the lease of which are unexpired. The site was originally a country one, but is now closely surrounded by streets and buildings. The ground has a rapid fall from the entrance to the lower part of the boundary wall, and in erecting the buildings advantage has been taken of the slope to divide it into two separate portions on different levels. On the higher part are constructed the barrack buildings and parade ground; on the lower are the barrack offices, out-houses, workshops, canteen, &c., which are built on the sides of a space laid out as the cavalry exercising ground.

The total area within the boundary wall is 5A. 2R. 6P.

The subsoil is gravelly, and most of it admits of drainage; but the lower part of the cavalry exercising ground is covered with mud in wet weather, partly on account of its receiving the drainage of the higher portion of the slope, and partly from the loamy nature of the ground, which becomes worked into a plastic material by the horses' feet. To obviate this defect as far as practicable, it is found necessary to remove the surface from time to time. The evil could be remedied by subsoil drainage, for which there is a sufficient fall and outlet.

The barracks are arranged in two half squares, one of which, opposite the entrance gate, is formed by the officers' quarters, hospital, riding house, guard-room, cells, &c. The other half square is formed by the same range of officers' quarters, and by two ranges of stables, with barrack-rooms over them. This half square overlooks the exercising ground, and forms three sides of the upper parade ground already mentioned.

Each range of stables and barrack-rooms is about 60 yards in length, and two stories high. The barrack-rooms are reached by a stone staircase carried up in the middle of the length of the range, giving access to a long corridor 5 feet 8 inches wide, and 10 feet high, running from end to end of the building, out of which corridor the men's rooms enter right and left. The only light supplied to these corridors is by a half glass door at each end, and by a small window in the staircase.

The soldiers' rooms are all of a size. They are about 28 feet long by 16 feet 9 inches broad, and 10 feet high.

The total accommodation in the men's rooms, according to present regulation, is for 180 men, with about 515 cubic feet per man.

There are seven non-commissioned officers' rooms, with accommodation in them for 12 men. The following table gives the accommodation in the men's rooms as compared with what it would be at 600 cubic feet per man:—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 20 | 180 | 160 | 20 |

The present number of men per room is nine. If the number were reduced to seven it would afford more space than 600 cubic feet. By reducing the number to eight men per room, a little less than 600 cubic feet will be given.

We recommend, then, that the number of men in each room be reduced from nine to eight.

Each room has one long low window, no more than 3 feet 2 inches high, while the breadth is 8 feet 8 inches. This form of window has the great disadvantage of leaving a large unlighted and unventilated space above it, and as it is generally placed near one end of the room it leaves the other end in obscurity. The windows open by sliding.

In this, as in other similarly constructed barracks, it would be very advisable to open a window in the dark end of the room.

Provision is made for ventilating each room by two air bricks placed close to the ceiling at the dark end; but there are no outlets for foul air except by a sliding shutter over the door, which opens into the corridor, and as the corridor itself is unventilated, this opening cannot properly be considered as an outlet. Each room should have a separate outlet shaft carried from the ceiling to above the roof, and the two air-bricks could be used as inlets by covering both of them by a cornice of perforated zinc of the usual construction. The sliding shutter over each door should be removed, and the space filled with panes of perforated glass, which would permit a freer circulation of air, and admit some light to the corridor.

The corridor itself requires both light and ventilation. The readiest way of effecting this would be to carry up two square shafts the entire breadth of the corridor from its ceiling to the ridge, to cover the shafts at the ridge by ventilating skylights, and to

plaster the shafts inside. These shafts should be placed about midway between each end window of the corridor and the centre.

Further to improve the ventilation of the corridor, we would recommend that perforated glass panes be placed in the upper row of the windows at the ends of the corridors, and in the staircases.

The barrack-rooms are warmed by small grates, resembling those in use in ordinary cottage rooms. We should propose to remodel these grates to warm part of the admitted air. In these barrack-rooms, as in others of similar construction, the door is placed close to the fireplace, an arrangement which ought always to be avoided, on account of its interfering injuriously with the warmth and ventilation of the room, and the comfort of the men. In the present case it would be a great improvement to remove the doors to the opposite ends of the rooms, which could be easily done, as the wall of the rooms on the side next the corridor is of wood.

The non-commissioned officers' rooms are at the ends of the corridors. They should each have a silk-flap ventilator placed in the chimney. A similar ventilator should also be put into the chimney of the library.

The serjeants' mess-room is not ventilated. It is used for cooking, and also as a sleeping room for the mess cook. It should have a shaft and inlets, like the men's rooms.

The stables are each provided with eight inlets for air, close to the ceiling, but these are not sufficient to prevent the stable effluvia passing through the ceiling to the barrack-rooms. We would recommend that each stable should have four shafts carried up from the ceiling to above the roof, one from each corner, the united area of the four shafts being equal to 12 square inches per horse. The shafts should be lined inside with carefully soldered zinc, to prevent escape of effluvia into the barrack-rooms. The stables are rather dark, and might advantageously be provided with more window space.

There are no litter sheds, and the litter has to be spread out directly under the barrack-room windows. Proper sheds, at a short distance from the front of the buildings, should be provided.

Each barrack-room is lighted with gas, but the burners require ventilating funnels and tubes carried into the chimney.

It has been already stated that the ground on which these barracks stand is on two levels. One end of each barrack range overlooks the lower level, and is supported upon an arched basement underneath each end stable. There are two of these arches, one under the end of each range. They are reached by descending two or three steps below the level of the lower parade ground, and are provided with a half glass door, affording light to the interior. In these arches are placed the ablution-rooms belonging to the barracks. They are small, low in the roof, dark, damp, and unventilated; and it is difficult to see how these defects can be obviated. They are distant from the barrack-rooms, and on all these accounts cannot be used without risk to the health of the men.

The water tanks for supplying them are under one end of the arch. They have no gratings nor pegs. There are slate ablution tables, but the tables have no ledges. Water for the cisterns is derived from the barrack roofs; and when the supply runs short, the men have to carry water from pumps at a distance. Altogether, the arrangements of these ablution houses are so defective that the men prefer washing in a bucket in the stables.

There are no baths, and no room to place them in.

This is clearly a case in which ablution-rooms should be built. They should be properly supplied with water, have tables with ledges, gratings, and pegs. They should be properly lighted and ventilated, and have a space cut off in each for a bath, with water laid on.

Along one side of the lower parade ground is a range of one-story buildings, containing the school-rooms, cook house, women's wash-house, latrines, &c.

The school-room is close to one of the ablution-rooms. It has windows on one side, and no means of ventilation. It should have a shaft carried up from the ceiling to above the roof, and inlets of the usual construction.

Adjoining the school-room is the women's wash-house. It has two boilers with brick washing benches, and is lighted by a skylight. It has no water laid on, is not ventilated, and has no means of drying or getting up linen. It should be provided with fixed tubs and water laid on, gratings for the feet, a louvre in the roof for ventilation, and a proper drying stove and ironing table.

Next the wash-house is a very good kitchen, light, roomy, well ventilated, and clean. It has nine boilers, and an excellent brick oven of a construction common in the district, and one stated to be well adapted for its purpose. It can roast or bake half the rations. Altogether this is one of the best barrack kitchens we have seen.

It would, however, effect an economy in the expenditure of fuel, if one fire-grate were constructed for each two boilers, instead of one grate for each boiler, as in the present arrangement.

There are two manure heaps on opposite sides of the lower parade ground, one of which and an ash-pit adjoins the cook house. Both are placed at a considerable distance from barrack-rooms, but they are not well constructed, as they are dug out below the level of the ground. We would recommend that both manure heaps and ash-pit be filled up to the level and properly paved and drained. There is another ash-pit behind the hospital and close to the men's barrack-rooms. The situation is a bad one, although the ground is paved. It would be much better in this instance to clear away the ash-pit and substitute an iron cart for receiving the barrack and hospital refuse.

These barracks are provided with water latrines, but they have no proper divisions, and there is no space for half-doors. The only improvement we would suggest in them would be to provide them with proper seating and divisions, and that, instead of the present precarious method of supplying them with water by pumping, a constant water supply be provided.

Adjoining the canteen and tailor's shop there are two small latrines connected with cesspits. These should be reconstructed, supplied with water, drained, and the cesspits filled up.

All the buildings are drained into the town sewers, but the surface gratings are not all trapped. This defect should be remedied.

Water is obtained from pump wells and from the barrack roofs. The plan of supplying water from the subsoil drainage of town districts, such as this, is always a bad one, and as water can be obtained from the town mains we would recommend this to be done at once.

At the lower end of the parade ground is a building, formerly used as a hospital, in which are situated the quartermaster's stores and tailor's shop. The latter requires ventilation by a shaft and inlet.

At a short distance from this building is the forge, which is complained of as being too small.

The canteen occupies a one-story range of buildings on the side of the lower parade ground opposite the cook-house. The rooms are very low in the roof, and are not ventilated. We would advise a silk flap ventilator to be placed in each chimney close to the ceiling; that each gas-burner should be provided with a ventilating funnel and tube into the chimney, and that each window should have a pane of perforated glass put into the upper row of panes. Both the tap-room and non-commissioned officer's room should be ventilated in this way.

On the slope below the canteen is situated the infirmary stables, with a very small and inconvenient surgery attached.

Near the entrance gate, on the left-hand side, is the riding house. It is very dark and damp, and not sufficiently ventilated. It should have four large skylights in the roof, 4 feet by 8 feet each, and louvres in the ridge for ventilation.

The provost's establishment, which is opposite the riding school, has no kitchen, the prisoners' cooking being all done at the grate in the provost serjeant's room. There are four cells facing the barrack square, with a narrow dark passage running along behind for communicating with the cells. This passage is warmed by a stove at one end, and at the opposite end of the passage is placed a dark water-closet without any sufficient ventilation. The effluvia from this water-closet could be detected in the passage. The space should be lighted and ventilated, and cut off by a door from the rest of the passage.

The guard-room requires a shaft and inlet for ventilation, and a remodelled grate for warming part of the air. The cells behind the guard-room should have a small shaft, with an area of six or eight square inches, carried up from the ceiling for ventilation.

This barrack has no day-room nor cleaning room, and no accommodation for married soldiers except in the barrack-rooms.

*The following are the Sanitary Improvements we would advise to be carried out:—*

1. Reducing the number of men per room from nine to eight.
2. Lighting and ventilating the corridor by two shafts and ventilating skylights, as described, and by perforated glass panes in the corridor and staircase windows.
3. Ventilating the men's rooms by a shaft carried from the ceiling of each room to above the roof, and by a perforated zinc cornice placed over the present inlets. Fire grates to be remodelled to warm part of the admitted air. Perforated glass panes to be placed over the present doors. An additional window to be opened at the dark end of each room, and the doors to be removed to the opposite ends of the rooms. A ventilating funnel and tube to be provided for each gas-burner.
4. Non-commissioned officers' rooms and the library to be ventilated by silk-flap ventilators into the chimneys. School-room to be ventilated by a shaft and inlets like the barrack-rooms. Tailor's shop to be ventilated by a shaft and inlet. Canteen tap-room and non-commissioned officers' room to be ventilated by silk flap ventilators and by perforated glass panes in the upper window sashes. Guard-room to be ventilated by a shaft and inlets, and to have a remodelled grate. Guard-room cells to be ventilated by a shaft through the roof. Non-commissioned officers' mess room to be ventilated by a shaft and inlet.
5. Stables to be ventilated by a shaft from each corner, as described, and to have additional window space. Riding school to have skylights in the roof, and louvres in the ridge for ventilation. Stables to be provided with litter sheds, and the ground in front of the stable doors, when repaving is required, to be paved with square setts.
6. Water to be obtained from the town mains.
7. Two new ablution houses, suitably provided with lavatory arrangements, and one bath in each, with water laid on, to be erected instead of the present ablution houses.
8. Latrines to have proper seats with divisions. The privies at the tailor's shop and canteen to be drained, converted into water latrines, and the cesspits filled up. Lower end of the parade ground to be drained.
9. Women's wash-house to be ventilated by a louvre, to have fixed tubs with water laid on, a drying stove, and means of ironing linen.
10. Manure heaps and ash-pit beside the lower parade ground to be filled up to the level of the ground, paved, and drained. Ash-pit behind the hospital to be abolished, and an iron cart substituted.

*Birmingham Barrack Hospital.*

This hospital consists of a small brick building situated in the parade ground fronting the entrance gate of the barrack, close to the officers' quarter, and at the end of one of the stable ranges. It is constructed on the plan usually adopted for regimental hospitals, and has a central passage and staircase with the wards and offices opening right and left out of them. The building is two stories high. It has no enclosure, but opens directly on the parade ground. Behind it there is a small back yard, containing the latrines, dead-house, &c. A verandah has been carried round two sides of this court to afford a covered access to the outbuildings, and as the roof of the verandah is not glazed, it darkens one of the wards. This defect could be removed by making the roof of the verandah of glass where it crosses above the ward window. The ground floor of the hospital contains the surgery, also used as a provision store, the hospital-serjeant's room, the kitchen, and one small ward. On the flat above are, one large ward running from front to back of the building, one small ward with windows on one side, and a store.

The total regulation accommodation is for 20 beds, but the wards are very much overcrowded, as will be seen from the following table :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet per Bed. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 2 | 5 | 3 | 2 |
| 3 | 10 | 5 | 5 |
| Total - | 20 | 10 | 10 |

The present wards will accommodate 10 sick at considerably less than 1,200 cubic feet per bed. The building does not admit of extension ; and even if it did, we should scruple to recommend such a step, considering the short period the lease has to run. Additional ward space might be found by removing the store on the upper flat of the hospital. It is possible also that space might be found for constructing a small detached kitchen. Were this done, another room would be added to the ward space. All the present wards are ventilated by Sheringham's ventilators, but they are not sufficient. In the two smaller wards, Nos. 1 and 2, we would propose to improve the ventilation by inserting a silk flap ventilator into each chimney, but in the large ward, No. 3, it will be necessary to carry a ventilating shaft through the roof of the building. It would further improve the ventilation of the whole building to alter the windows over the passage door, by making them turn on pivots, and by inserting panes of perforated glass in the upper sash of the stair windows.

We would also advise remodelled fire grates to be introduced instead of the present ones. There is a gaslight in each ward, but the burners have no means of ventilation ; and we would recommend a ventilating funnel and tube to be provided for each.

This hospital has neither lavatory nor bath-room. The patients wash under the verandah in the hospital yard, and the only means of bathing is a slipper bath and a shower bath kept in the back yard. The dead-house is sometimes used as a bath-room.

The kitchen is properly supplied with the means of cooking, but it requires ventilation by a shaft 12 inches square, carried above the roof of the building.

Water is obtained from a pump in the hospital yard, a means of supply open to the objections already stated in regard to the barrack supply. Water should be laid on to the hospital as well as the barrack. There is no water-closet within the hospital.

There is a small narrow water latrine in the yard behind, to which the patients obtain access by the verandah. The accommodation is certainly not all that could be desired, but there is no space to provide better. The present latrine might be improved by a skylight.

*The Sanitary Improvements we would recommend for this Hospital are the following:—*

1. Reduction of numbers of sick in the existing wards to the extent stated, and providing additional ward space by removing the store from the upper floor, and, if possible, the kitchen to a detached building.

2. Ventilating the passage and staircase, by altering the windows, and by perforated panes, as described. Introducing a silk flap ventilator into the chimney of each smaller ward, and a ventilating shaft into the larger ward. Ventilating the kitchen by a shaft carried from the ceiling to above the roof.

3. Providing, if possible, a small bath-room and ablution-room, with hot and cold water laid on, and a covered communication from the hospital.

4. Glazing the roof of the verandah where it passes over the ward window. Lighting the latrine by a skylight.

## II.—COVENTRY.

### Cavalry Barracks.

These barracks are situate at the western extremity of the town of Coventry, within an enclosure 3A. 2R. 29P. in area, and are closely surrounded on three sides by houses. On the fourth side they are bounded by a common, across which an open ditch passes, receiving the sewage of the town. They were originally an old inn, with its stables, and were purchased and occupied as barracks about the year 1792. The inn itself is now used as officers' quarters, and the soldiers' rooms were formerly lofts over the stables and outhouses. There are three separate sets of barrack-rooms; two of these are over stables, and are reached by stone staircases, from the top of which galleries or corridors with windows on one side run along the range, and afford access to the men's rooms. The windows of these galleries overlook private property, and the light which would otherwise be derived from them, is materially diminished by slanting boards, placed to prevent the men looking out. The windows do not admit of being fully opened, and cannot be properly cleaned. This defect should be remedied. The third set of rooms is entered from an outside wooden gallery, and are chiefly occupied as married quarters, school-room, barrack offices, &c. A portion of the barrack-rooms look over the open ground, but others have their windows opening into the narrow back alley which formerly led into the inn yard. In one corner of this alley are placed the water-closets belonging to the officers' quarters, with a water cistern over them. They are badly constructed, and placed so that they are a nuisance at times to the rooms above. A similar nuisance arises from a urinal in the opposite corner of the alley. Both water-closets and urinal should be removed, and reconstructed elsewhere.

A number of buildings have been added at different periods to the old inn offices, such as the hospital, cook-house, lavatory, workshops, guard-room, riding house, &c. These buildings are situated round the open area of the parade ground.

There are 17 soldiers' rooms over the different ranges of stables. With one or two exceptions they are from 25 to 28 feet long; they vary in breadth from 19 to 26 feet, and they are from 9 feet 6 inches to 10 feet 6 inches high. Three only of them have two windows, and all the others have one window per room. The total regulation accommodation is for 201 non-commissioned officers and men, the details of which, as regards the men's rooms, are as follow:—

| Rooms. | Regulation Number of Men. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 10 | 9 | 1 |
| 2 | 12 | 10 | 2 |
| 4 | 18 | 13 | 5 |
| 5 | 5 | 5 | — |
| 6 | 13 | 11 | 2 |
| 7 | 12 | 9 | 3 |
| 8 | 12 | 9 | 3 |
| 9 | 12 | 9 | 3 |
| 10 | 13 | 10 | 3 |
| 11 | 12 | 9 | 3 |
| 12 | 12 | 9 | 3 |
| 13 | 12 | 9 | 3 |
| 14 | 12 | 8 | 4 |
| 15 | 12 | 8 | 4 |
| 16 | 12 | 8 | 4 |
| 17 | 13 | 9 | 4 |
| Total - - | 192 | 145 | 47 |

These rooms ought to hold at the outside 145 men, and 47 is the number for which additional accommodation should be provided.

The buildings are old and very badly arranged for barrack purposes. The appear to have been originally appropriated only temporarily, and the occupation has become permanent, while the buildings are evidently unsuitable for such a purpose. The men's rooms are saturated with ammonia from the stables, and would require thorough scraping, limewashing, and ventilation to purify them. Each room has openings through the ceiling into the roof, but they are insufficient for ventilation. There are, besides, square openings over the doors into the passages; but these openings are provided with louvres, which are turned the wrong way, so that any air passing through them is thrown down upon the men in place of being carried towards the ceiling. We would propose to remedy the defects in the ventilation by carrying a shaft from the centre of the ceiling of each room to above the ridge of the roof, and by an inlet for air of the usual construction in the outer wall, opening within the room, close to the ceiling, and covered with a perforated zinc cornice.

The louvre over the door should be reversed to throw the air up, and panes of perforated glass should be placed in the upper row of each of the passage windows. The fire-grates in all the rooms should, at the same time, be remodelled to warm part of the admitted air.

The ventilation of the stables is also defective, and some of them have no opening at the back.

Additional light should be given to these stables by enlarging existing windows where practicable, and the stables should be ventilated by carrying a shaft from each corner above the roof. These shafts should have a conjoint area equal to 12 square inches per horse, and should be carefully lined with soldered zinc.

The serjeants' rooms are very close, and have no ventilation. The room occupied by married soldiers should be ventilated like the barrack-rooms. The serjeants' mess and the library and school-room are both dark, and require ventilation like the barrack-rooms. Additional light might be given to these rooms by skylights.

These barracks are not supplied with gas, although this could be readily done. One gas-burner should be introduced into each barrack-room; and if placed under the foul-air shaft, it would be sufficiently ventilated without the usual tube and funnel.

There is a good detached ablution-room, with a water tank filled by a force pump, and an ablution table and basins. The table has no bead, and gratings are required for the men to stand on, and pegs for hanging coats.

Additional light should be given through the roof.

There is a space partitioned off from the ablution-room, apparently intended for bathing, but there are no baths. Two baths should be provided, with water laid on.

There is a wash-house with two boilers; it is a small, low-roofed, dark, and unventilated room under the serjeants' mess. It has no fixed tubs, gratings, water, nor means of drying and getting up linen. It could be improved in every thing except the lighting, but it is questionable whether it would not be cheaper to build a proper wash-house.

There is a good cook-house supplied with boilers and a brick oven recently erected. The boilers, however, are very old and have divisions in them; they are set in pairs, with one large fire to two boilers, but are not economical, as they consume 18 cwt. of coal per week for 150 men.

A row of workshops has been constructed along one side of the barrack enclosure; they all require ventilation through the roof, and inlets for air.

The riding house is ventilated, but is dark, and requires two skylights, 8 feet by 4 feet, in the roof.

The canteen tap-room requires ventilation by a silk flap ventilator in the chimney, and by perforated glass panes in the windows.

Ventilation by a shaft and inlet and a remodelled grate are required for the guard-room. There are four cells opening out of a passage from the guard-room. They are very dark on account of the windows being painted to prevent persons looking through. Ribbed glass, which answers the same purpose while it admits light, should be substituted for the present glazing.

The barracks are supplied with water from wells sunk in the yard. This method of supply is open to the usual objections, and should be discontinued. The town water should be laid on instead.

The barrack and enclosure are surface drained to an outlet passing under the manure heap. A few of the drains only are trapped. All the privies require drainage and reconstruction as water latrines, with divisions of seats, half-doors, light, and ventilation. It was stated that the main drain of Coventry passes through the barrack square. If so, an outlet can be at once obtained, and all the cesspits should be abolished. The manure heap and ash-pit are both together. They are of the usual defective construction, and sunk below the level. They should be raised at least to the level of the ground, paved, and drained; all ash-pits should be covered, and arrangements should be made for the daily removal of the whole manure and refuse.

Coventry barracks are in many respects so defective that nothing short of their re-construction can make them what they ought to be as regards the health and comfort of the men. The whole of the old inn stables and outhouses should be cleared away, and suitable barracks and stables for the force erected instead. *In the meantime, however, we would recommend the following sanitary improvements to be carried out:—*

1. Reduction of numbers of men in each room to the extent stated.

2. Ventilation of each barrack-room, married soldiers' room, non-commissioned officers' mess-room, guard-room, workshops, and the library and school-room, by a shaft carried from the centre of the ceiling to above the roof, and by an inlet for air; the louvres opening from the barrack-rooms into the passage to be reversed, and perforated glass panes to be put in the passage windows. Barrack-room and guard-room grates to be remodelled.

3. Stables to be ventilated by a shaft lined with zinc, carried from each corner to above the roof. Additional light to be given to the stables where practicable. Riding school to have two skylights in the roof.

4. A gas-burner to be introduced into each barrack-room.

5. Ablution-room to have a bead put to the table. Gratings and pegs to be provided. Two baths, with water laid on, to be placed in the recess, and a skylight to be put in the roof.

6. Women's wash-house to have fixed tubs, with water laid on, and a drying and laundry stove.

7. Water to be laid on over the barrack, from the town water supply.

8. Privies to be drained and reconstructed as water latrines, with divisions, half-doors, light, and ventilation, and the cesspits abolished. Manure heap and ash-pit to be filled up to the level, paved, and drained, and provision to be made for the daily removal of manure and refuse. All drains to be trapped.

### *Coventry Barrack Hospital.*

This hospital is a small detached two-story building, situated at the lowest side of the parade ground. It has no separate enclosure, except a small narrow yard at one end, in which is placed the privy, dead house, &c.

On the lower floor are situated the surgery, kitchen, and one large ward with three windows on each of the two opposite sides, and one large window at one end. The upper floor is reached by a spacious light staircase, and contains a large ward similar to the one below, a small ward, and a serjeant's room. The total accommodation is for 23 beds, the details of which are given in the following table:—

| Wards. | Present Number of Beds. | Number at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| No. 1 - - | 11 | 9 | 2 |
| „ 2 - - | 11 | 9 | 2 |
| „ 3 - - | 1 | 1 | — |
| Total - - | 23 | 19 | 4 |

At less than 1,200 cubic feet per bed these wards will accommodate 19 sick. There is no sleeping accommodation for orderlies, except in the wards.

The ground-floor ward is ventilated by four hollow beams carried across the ceiling, with inlets for air. The only change we would propose would be to provide a shaft, and to cover each of the inlets with a perforated zinc cornice. The large upstairs ward has six openings through the ceiling into the roof. Two of these we should propose to convert into shafts carried above the roof, and four inlets should be provided, two on each side the ward. The small ward should have a silk flap ventilator into the chimney, and one inlet for air. The fire-grates are very small, and might be remodelled with advantage to give additional warmth to the wards. All the ward windows should be hung to pull down at the top, which is not the case with most of them at present.

The hospital has no water-closet. There is a privy and cesspit in the yard, both of which are very offensive. The cesspit should be abolished, and the privy reconstructed as a water latrine. A suitable projection for a water-closet opening from the staircase could easily be built at the end of the hospital next the yard; and as there is neither bath-room nor lavatory, space could be obtained for these in the same projection. There is an ash-pit in the hospital yard, which should be abolished, as it is quite unnecessary; and the hospital refuse should be carried to the barrack ash-pit.

*The following are the Sanitary Improvements required for this Hospital:—*

1. Reduction of the number of beds to give 1,200 cubic feet per bed.

2. Ventilation to be improved by providing a shaft, and by covering the inlets in the lower ward with perforated zinc diffusing cornices. Two shafts and four inlets for air to be provided in the upper large ward. Small upstairs ward to have a silk flap ventilator into the chimney and one inlet for air. Ward windows to be made to open at top. Ward grates to be remodelled.

3. Water to be laid on. A water-closet, bath, and ablution-room, with hot and cold water laid on, to be provided. Cesspit in the yard to be abolished, and the privy drained and converted into a water latrine. Ash-pit to be removed.

## III.—NORTHAMPTON.

### Royal Artillery Barrack.

This barrack is situated on one side of a public street at the outskirts of the town of Northampton. The ground slopes from the street towards the barrack, and from the barrack down the parade ground in the direction of its length, to the lower boundary wall and towards the open country. The fall is amply sufficient for every purpose of drainage were it taken advantage of, which is not the case at present. The river Nen is about a quarter of a mile from the boundary, and there is an outlet at the lowest end of the parade ground. The total area within the boundary enclosure is 9A. 29P.

The subsoil is sandy with a slight admixture of loam. In dry weather the surface is dry and dusty, but in wet weather it is sloppy from want of drainage.

The barrack buildings are of stone, and were constructed at the end of last century.

They are arranged as follows:—First, the guard-room, canteen, cells, and one or two offices are placed close to the gate. Opposite these and at a short distance are three blocks built parallel to the boundary wall. The centre block contains officers' quarters, and each of the two sides blocks contains a range of stables on the ground floor, with a range of men's rooms over them, and above the men's rooms are attics intended for stores, but which are now partially occupied as soldiers' rooms. Behind these blocks, on each side the parade ground, are placed the forage sheds, privies, dung heaps, and ash-pits, and near the lower end of the slope on one side is placed the hospital, with the infirmary stables opposite to it.

The barrack-rooms in each block are reached by a stone staircase in the middle of its length, from the top of which a corridor opens right and left with a window at each end. In one of the blocks the end rooms have been appropriated for pensioners and stores, and the corridor blocked up, so that the light and ventilation, such as they were, of one half of the corridor have been cut off to obtain this accomodation; part of which, that containing stores, could have been quite as well obtained by appropriating an attic for the purpose. We are of opinion, that the pensioners and stores should be removed, and the ventilation of the corridor at that end completed by reopening the end window.

The soldiers' rooms open right and left out of the corridor.

Access is obtained to the attics by means of a narrow stair opening out of the corridor.

There are altogether five serjeants' rooms, 14 soldiers' rooms, and two attics extending the whole length of the blocks, and the total regulation accommodation is for 218 non-commissioned officers and men; but at the time the return was made to us the actual occupants of the barrack-rooms exceeded the regulation accommodation by no less than 25 per cent. If such deviations in allotting the space in barracks are to be continued, it need be no matter of surprise if a continued high sick rate is the result. The details of the regulation accommodation, contrasted with what it would be at 600 cubic feet per man, are given in the following table:—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A. Wing. | | | |
| 1 - - | 9 | 7 | 2 |
| 2 - | 9 | 7 | 2 |
| 3 - - | 9 | 7 | 2 |
| 4 - - | 9 | 7 | 2 |
| 5 - - | 4 | 4 | — |
| 6 - - | 9 | 7 | 2 |
| 8 - - | 9 | 7 | 2 |
| Attic - - | 46 | 26 | 20 |
| C. Wing. | | | |
| 1 - - | 9 | 7 | 2 |
| 6 - - | 9 | 7 | 2 |
| 7 - - | 4 | 4 | — |
| 8 - - | 9 | 7 | 2 |
| 9 - - | 9 | 7 | 2 |
| 10 - - | 9 | 7 | 2 |
| 11 - - | 9 | 7 | 2 |
| Attic - - | 46 | 26 | 20 |
| Total - | 208 | 144 | 64 |

The whole barracks, including the attics, have space for no more than 144 men at somewhat less than 600 cubic feet each, and the men should be allotted to the rooms in the proportions given in the above table. The attics are, however, bad barrack-rooms, and are more suited for stores. They should certainly not be occupied in their present state, except on emergency.

And if additional accommodation for troops is required on this station the attics should be raised and converted into proper barrack-rooms.

The rooms on the first floor are of the usual construction. They open right and left out of the corridor by doors close to the fireplace, and there is one low window near the fire and opposite the door, leaving the rest of the room in obscurity. An additional window ought to be opened in each room, and the door moved to the end furthest from the fire, which would materially improve the healthiness and comfort of the rooms.

In reports on other barracks we have recommended the lighting and ventilation of the corridor by shafts carried from its ceiling to the ridge. In the present instance the length of the corridor is not so great as to render these shafts requisite, provided additional light be admitted to it by glass panes placed in the upper part of the wooden partition separating the soldiers' rooms from the corridor. Advantage should also be taken of the staircase leading to the attics to make it fulfil the purposes of a shaft for ventilating the corridor, which could be easily done by carrying a large louvre from its ceiling to above the roof. Panes of perforated glass should at the same time be placed in the upper sashes of the windows at the end of the corridors.

The attics extend the whole length of each block, but they are only about half the breadth of the block, because a partition is carried from the floor on each side to the slope of the roof, about six feet within the eaves. They are divided by arches, in which are carried up the chimney flues of the rooms below, and they are partially lighted by a small window at each end, and by a few dormer windows in the roof. They have no fireplaces, and are warmed by iron stoves.

The ventilating arrangements of the men's rooms are of a somewhat singular character. There is an opening in the ceiling of each room, with a sliding cover giving egress to the foul air into the space cut off from the sides of the attics already mentioned, and there are gratings with covers in the partition dividing the space from the attic, by which the foul air from the rooms below can pass directly into the attics, while the attics themselves have no means of ventilation whatever. The practical effect of this singular arrangement is the following :—If the covers be left on the openings, either above or below, there must be stagnation of air ; in summer, if the covers were removed from the openings, the foul air of the lower rooms would pass directly into the attic rooms to be breathed by the men there, as there is no provision for its escape ; while in winter, if the attics were occupied by men, the fires in the rooms below would draw the foul air down through the openings, to be breathed by the men in the lower rooms. This arrangement, which in practice secures that in one way or other foul air shall be breathed by the men, must be done away with as follows :—From the central opening in the ceiling of each of the lower rooms a shaft of the usual area and construction must be carried directly through the roof of the block ; next, each of these rooms must have an inlet for air, covered by a cornice of perforated zinc through the outer wall close to the ceiling at the end furthest from the fire. The fire-grate in each of these rooms should be remodelled to warm part of the inflowing air during winter.

The attics should be ventilated by louvres with four divisions, on Muir's principle, one louvre being carried through the ridge between each pair of arches.

It will be necessary at the same time to ventilate the stables to prevent the effluvia passing into the barrack rooms, for which purpose a shaft should be carried from each of the four corners to above the roof, and the shaft should be lined inside with soldered zinc.

The barrack is lighted by candles, although gas can be readily obtained. One burner should be placed in each room under the central ventilating shaft, to secure that the effluvia are carried off.

A small room, called a school-room, is used as a tailor's shop. It requires a silk flap ventilator in the chimney, and an inlet for air. There is another school-room of the same construction as the barrack-rooms. This room requires a shaft and inlet for ventilation. All the non-commissioned officers' rooms should have silk flap ventilators into the chimneys.

There is no ablution-room, and no bath-room at present. We are informed that two are to be built. They should each have a space cut off for one bath, with water laid on.

There are no proper arrangements in these barracks for washing or getting up linen. There is a small building near the hospital intended for a wash-house, but it is not now used for such a purpose. It has boilers, but no other convenience. It might be made sufficient for the wants of the barrack by putting up fixed tubs and a drying stove, and laying on water.

Each soldiers' block has a cook-house at the foot of the stair. They are large light rooms, with six boilers in each. A brick oven has just been put up in one of the cook-houses, with capacity to cook for 100 men. It requires an hour to heat, two and a half hours to bake, and about 70lbs. of coal. It is stated to answer satisfactorily.

The cook-houses themselves being under the men's rooms should have better means of ventilation ; and if space can be found for a shaft nine inches square, without interfering materially with the rooms above, one such shaft should be carried from the ceiling to above the roof.

The method of water supply is bad. It is derived partly from the roofs, the water from which is caught in a tank capable of holding from 7,000 to 8,000 gallons. There are, besides, two deep wells sunk in a porous subsoil, partly of shale.

One of these wells is 130 feet deep, and about 40 feet from it there is a cesspit which receives the whole surface drainage of the stables. This cesspit has no overflow, and the foul water it receives has to find its way into the earth. Of course the readiest outlet for it is through the shale into the adjoining well, which there can be but little doubt receives part of its contents filtered, as the water raised from the well appears to contain a considerable quantity of organic matter.

This system of water supply is decidedly objectionable, and should be altered by introducing the town water.

In the proper sense of the term there is no drainage in these barracks. All the surface rain-fall, and the water from stables, cook-houses, &c. is conducted into two large cesspits near the wells, the position of one of which we have just described.

The privies are of course not drained. They are placed on each side the parade ground over cesspits periodically emptied, and close to the dung heaps.

They are in a noxious and offensive state, and require entire reconstruction as water latrines, with suitable divisions and half-doors, and the buildings require light and ventilation.

To enable this to be done, and the whole barrack to be properly drained it will be necessary to find an outlet for the drainage. It was stated to us that a new sewer was about to be constructed, which would pass the barrack enclosure ; and should this be done an outlet could be easily obtained. But if the work is not likely to be carried out shortly, we would recommend that another outlet be sought for beyond the lower end of the parade ground. The fall is so good that drainage works could be easily carried out.

The present urinals are of very defective construction, and require to be remodelled, and to have water laid on for cleansing. The guard-room urinal is too close to the cell window.

There is no outlet for the drainage of the infirmary stables, all of which sinks down through the paving. This should be remedied.

The surface drainage and paving outside the barracks is not good. It should be relaid with square sets when repairs are needed.

The manure heaps are placed one on each side the parade ground. They are excavated below the surface level, and are objectionable on that account. We would recommend that they be filled up to a few inches above the level of the ground, and that they be surface paved and drained. The ash-pits should be dealt with in the same manner.

The ventilation and warming of the guard-room and cells are defective. The guard-room requires a shaft and inlet and a remodelled grate, and the cells should each have a shaft about 6 inches square through the roof. They should also have an inlet for air through the lower part of the door, capable of being closed except when the stove is lighted, and fresh air should be admitted round the stove.

The canteen tap-room and non-commissioned officers' room require each a silk flap ventilator into the chimney, and perforated glass panes in the upper sashes of the windows.

Northampton barracks are deficient in day-rooms, library, married quarters (except in soldiers' rooms), cleaning-room, and workshops, except a forge and shoeing shed.

*The Sanitary Improvements required for the existing Buildings are the following :—*

1. Reduction of the number of men of the rooms to the extent stated.

2. Ventilation of each soldier's room by a shaft and inlet, and by a remodelled grate. An additional window to be opened in each room. Doors to be removed to the end of the room furthest from the fire.

3. Corridors to be lighted by glass panes in the upper part of the partitions of the soldiers' rooms.

Pensioners and stores to be removed from the men's blocks, and the corridor end window restored. Each end window and each stair window to have panes of perforated glass introduced. Staircases to be ventilated by louvres through the roof.

4. Attics to be ventilated by louvres in the ridge, and to have additional light by means of skylights.

5. A gas-burner to be introduced into each barrack-room.

6. Stables to be ventilated by shafts from each corner carried above the roof.

7. School-room to be ventilated by a shaft and inlet. Tailor's shop to be ventilated by a silk flap ventilator into the chimney. Guard-room to be ventilated by a shaft and inlet, and to have a remodelled grate, and the cells by shafts and inlets as described. Canteen tap-rooms to be ventilated by silk flap ventilators and perforated glass panes in the windows. Non-commissioned officers' rooms to be ventilated by silk flap ventilators. Cook-houses to be ventilated by shafts.

8. Two ablution-rooms, with a bath in each and water laid on, to be provided.

9. Wash-house to be improved as described.

10. Town water supply to be laid on to the barracks.

11. Whole barrack to be drained to an outlet. Privies to be reconstructed as water latrines, with drainage, divisions of seats, half-doors, light, and ventilation, and all cesspits to be filled up. Drainage of stables and of parade ground to be improved. Urinals to be reconstructed and supplied with water.

12. Dung-pits and ash-pits to be filled up to above the level of the ground, paved and drained.

*Northampton Barrack Hospital.*

This building is situated at the lower end of the barrack parade, and is not surrounded by any separate enclosure. The surface drainage of the adjoining ground is defective, and after heavy rains the water finds its way into the kitchen. This is one of the results of the present state of the parade ground drainage, and will disappear when the ground is properly under-drained.

The hospital is two stories high. It has a kitchen, surgery, serjeant's room, and two wards. The passage and staircase are large and roomy, and the floors are all waxed. One of the wards is on the ground floor, and has regulation space for seven beds. It is very much over-crowded and should hold three beds at the outside. The other ward is on the upper floor, and has six beds where no more than three ought to be. Even with this smaller number the ward would be offensive from the want of ventilation. The total regulation accommodation in the hospital is for 13 beds. The windows open by sliding, and there are swing panes above the sliding part. The wards are low and confined, and the means of renewing the air are inadequate. Each ward will require a shaft carried from the ceiling to above the roof, and two inlets for air, one on each side. The fire-grates ought to be remodelled to warm part of the admitted air in winter.

The ward space at 1,200 cubic feet per bed is sufficient for about six beds, and additional accommodation will have to be provided by extending the hospital to make it commensurate with the requirements of the strength in barracks.

There is no bath-room. The shower bath stands in the passage. There is no lavatory for the sick and no water-closet. There is a small yard at one end of the hospital, containing a privy for the use of the sick placed over a cesspit, the contents of which when removed have to be carried through the yard. The dead-house is close to the privy, and is at present used as a coal store.

Amongst other deficiencies, this hospital has neither provision store nor pack store. It has no water supply except from a pump. It is lighted with candles, though gas might be obtained.

*We would recommend as follows with regard to the existing Buildings : —*

1. That 1,200 cubic feet be allowed to each patient, and that the hospital be extended to afford this amount.

2. The wards to be ventilated by shafts and inlets, and to have remodelled grates.

3. That the passage and staircase be ventilated by a louvre in the roof.

4. That an addition be made to the building accessible from the staircase, to contain a water-closet, a bath with hot and cold water, and an ablution table. That the privy in the yard be converted into a water latrine, drained, and the cesspit filled up.

5. That a better water supply be provided for the hospital, along with that for the barracks.

6. That gas be introduced, and a ventilated gas-burner put up in each ward.

## IV.—WEEDON.

Weedon barracks consist of two separate divisions at a short distance from each other. One division occupies elevated ground, and the other is situated on the banks of the canal close to the village.

This latter portion is now used for stores, military prison, chapel, &c., and the only part of the establishment at present occupied by troops is the barrack on the higher ground, to which this report has special reference.

The local position of this barrack is elevated, isolated, and healthy. It is built within an area of 4a. 31p. in extent, on a sandy and gravelly subsoil, with an excellent fall for drainage. The ground is a parallelogram, bounded on one side by the public road, but on the other sides surrounded by Government property. The officers' quarters are in a block close to the entrance. On the right and left of them are situated the guard-room, gun sheds, &c. At right angles to them, and at each end of the parade ground, are two ranges of stables, with men's rooms over them, called the East and West lofts, and opposite the officers' quarters are two blocks of barracks, known as the East and West barracks. Behind these, and at a lower elevation, are situated the cook-houses, wash-houses, &c., and below these again and further down the slope is the garrison hospital.

The buildings are all of brick, on stone basements, and were erected in the year 1806.

The barrack-rooms differ considerably in structure from each other; those over the stables are reached by three wooden staircases to each block. At the top of each end staircase are four rooms, and each centre staircase gives access to two rooms. The room space is carried up to the rafters, and the rooms are back to back with windows only on one side, except in the end rooms, which have windows on two adjoining sides. In some of the rooms there are windows opening into the staircase, which are of little use either for light or ventilation.

There are altogether 20 rooms, 10 in each block. 12 of these rooms have two doors each, and some of them have two fire-places. The rooms are dark and should have additional light, which could be most easily obtained by skylights in the roof.

There appear to be more staircases than are necessary for access to the rooms, or for the number of men, and possibly the central staircase of each block might be advantageously removed, and the space thrown into the barrack-rooms.

The East and West barracks are of better construction. They are two stories high, and have a wide central staircase, giving access to the rooms on the upper flat. The block called the East barrack contains three barrack rooms and two serjeants' rooms on each flat. The West barrack contains seven soldiers' rooms and two non-commissioned

officers' rooms. The following table gives the details of the accommodation :—

| Rooms. | Regulation Number of Men. | Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| East Barracks. | | | |
| 1 - - | 14 | 9 | 5 |
| 2 - - | 16 | 12 | 4 |
| 3 - - | 16 | 12 | 4 |
| 6 - - | 14 | 9 | 5 |
| 7 - - | 16 | 11 | 5 |
| 8 - - | 16 | 11 | 5 |
| West Barracks. | | | |
| 3 - - | 16 | 12 | 4 |
| 4 - - | 16 | 12 | 4 |
| 5 - - | 13 | 9 | 4 |
| 6 - - | 14 | 9 | 5 |
| 7 - - | 16 | 11 | 5 |
| 8 - - | 16 | 11 | 5 |
| 9 - - | 13 | 9 | 4 |
| West Lofts. | | | |
| 1 - - | 12 | 10 | 2 |
| 2 - - | 12 | 10 | 2 |
| 3 - - | 14 | 13 | 1 |
| 4 - - | 11 | 10 | 1 |
| 5 - - | 20 | 16 | 4 |
| 6 - - | 11 | 10 | 1 |
| 7 - - | 12 | 10 | 2 |
| 8 - - | 14 | 10 | 4 |
| 9 - - | 12 | 10 | 2 |
| 10 - - | 12 | 10 | 2 |
| East Lofts. | | | |
| 1 - - | 12 | 10 | 2 |
| 2 - - | 12 | 10 | 2 |
| 3 - - | 14 | 13 | 1 |
| 4 - - | 11 | 10 | 1 |
| 5 - - | 20 | 16 | 4 |
| 6 - - | 11 | 10 | 1 |
| 7 - - | 14 | 10 | 4 |
| 8 - - | 12 | 10 | 2 |
| 9 - - | 12 | 10 | 2 |
| 10 - - | 12 | 10 | 2 |
| Total - | 456 | 355 | 101 |

All the rooms, if occupied at 600 cubic feet per man, would accommodate 355 men, but from this number must be deducted the complement for rooms 1, 5, 8, and 10, in the East lofts, giving accommodation at 600 cubic feet for 46 men, which rooms are appropriated at present as escort room, tailors' shop, school and store room, and serjeants' mess. These misappropriations reduce the total accommodation to that for 309 men, giving a deficiency of accommodation at 600 cubic feet for 147 men.

None of the barrack-rooms are ventilated. Those over the stables communicate with each other by gratings in the division walls. The rooms in the East and West barracks have a few wire-gauze panes in the windows, which are of little or no use. The readiest way of ventilating the rooms over the stables would be to place a louvre, constructed on Muir's principle, as nearly as may be in the centre of the ridge, and continued down within the room with reversed louvres, to prevent down drafts, as described in the paper of instructions. Two inlets should at the same time be provided in the outer walls of each room. The stables require ventilation in the usual manner, by shafts carried up from each corner to above the roof. They should also have more window space, as the present amount is by no means sufficient.

The rooms in the East and West barracks require ventilation by shafts and inlets of the usual construction ; and each non-commissioned officer's room throughout the barracks should have a silk flap ventilator introduced into the chimney.

All the barrack-rooms are warmed by the old pattern grates. As a necessary supplement to the ventilation, these should be removed, and remodelled grates for warming part of the admitted air substituted.

The barrack-rooms are lighted with gas. The burners should be ventilated in the usual manner.

The ablution accommodation in these barracks is very defective, both as regards the size and position of the ablution-rooms and the supply of water. The rooms are very small, and contain accommodation for no more than 32 men at a time out of a garrison of 465. They are situated a long way from some of the barrack-rooms, and the men have to undergo unnecessary exposure in resorting to them, while the water supply is so defective, that, as we have been informed, a number of men have often to wash successively in the same water, so that due cleanliness is practically unattainable. The ablution accommodation should never be less than for 10 per cent. of the force ; and in all future barracks the ablution-rooms should, if possible, be so distributed that the men can reach them, whenever practicable, under cover.

There are no baths. One is required for every 100 men, with water laid on. The accommodation should be given, if practicable, close to the ablution-room.

There is a women's wash-house, with four coppers, but no other facilities for washing. It is dark and unventilated. It requires fixed tubs, with water laid on, gratings for the feet, a proper drying and laundry stove, and light and ventilation through the roof.

There are three cook-houses fitted up with boilers. Two of these are large and lofty ; and in one of them a good brick oven for baking and roasting meat has just been constructed. The third cook-house is narrow and confined. All of them require additional light, which could be readily given by skylights in the roof.

The water supply is derived from five pumps, situated in the yards behind the barracks. The pump in the west stable-yard has been dry for about two years, so that the men in quarters there have been put to great inconvenience, and water has to be carted for the horses.

The supply from the other wells is said to be enough for ordinary purposes, though it appears to us to be very doubtful whether it will be by any means enough for the improved drainage we are about to suggest, and we are of opinion that a proper raised tank should be erected on the highest ground, which tank should be filled from a well in the valley by means of a small steam-engine, and the water from this tank should be laid over the whole barracks and hospital.

The barracks are surface-drained down the slope, and the main drain is carried under the canal. None of the drains are trapped, and none of the privies are properly connected with them.

There are altogether six privies within the barracks, and they are in an offensive condition. Several of them taint the air to a considerable distance. They are of the usual barrack construction, and are placed over cesspits.

They should all be reconstructed as water latrines, and should have divisions of seats, half-doors, light, and ventilation, and they should be all drained to an outlet. Probably the present outlet could be used, but if there be any objections to this course, we would recommend that the whole sewage of the barracks be led in earthenware pipes into a tank of sufficient distance (say 500 yards) from inhabited buildings, and applied to irrigate grass land after being filtered.

No water is laid on to the urinals, and they are otherwise defectively constructed.

The ash-pits are near the cook-houses, but the ashes appear to be carried to the manure heap, which is outside the barrack boundary.

Attached to the guard-room at the entrance gate are a lock-up and cells. The guard-room itself is not ventilated, and requires a shaft and inlet, as well as a remodelled grate.

The cells are unventilated and not fit for prisoners. The lock-up is a large, dark, unventilated room. It is to be improved, and should have a shaft through the roof for ventilation.

The provost establishment is in the lower barracks, and is in good condition. Weedon barracks are deficient in the following accommodation :—

Day-rooms, school-room, library (there is one half a mile off), and store-rooms. There is no accommodation for married soldiers, a want which is much felt in these barracks. There is no drill shed, cleaning-room, nor workshops ; and proper sleeping and mess accommodation are required for non-commissioned officers.

*The following are the Sanitary Improvements necessary for the present Buildings :—*

1. Reduction of numbers in all the barrack-rooms to the extent stated.

2. Ventilation of all the rooms over the stables by louvres in the ridge and inlets for air constructed as described. Ventilation of the men's rooms in the East and West barracks by shafts and inlets. Ventilating funnels and tubes to be supplied to the gas-burners. All staircase windows to have perforated glass panes in the upper sashes. Stables to have increased window space, and to be ventilated by shafts carried up from each of the corners to above the roof. Guard-room and lock-up to have a ventilating shaft through the roof and an inlet for air. All the barrack-room and guard-room grates to be reconstructed to warm part of the admitted air. Canteen tap-room and non-commissioned officers' rooms to have silk flap ventilators in the chimneys, and perforated panes in the windows.

3. Ablution accommodation to be extended and improved. Water to be laid on constantly to the tables. Gratings and pegs to be provided, and ventilation to be introduced through the roof. Baths with water laid on to be provided in the proportion of one bath to every 100 men.

4. Women's wash-house to be provided with fixed tubs and water laid on, and to have gratings and a drying and laundry stove. Light and ventilation to be afforded through the roof.

5. Cook-houses to have additional light by sky-lights.

6. Water supply to be increased and distributed over the barracks as described.

7. Privies to be reconstucted as water latrines ; to have light, ventilation, divisions of seats, and half-doors ; to be drained to an outlet, and the sewage disposed of in one of the modes suggested. All drains and gully grates to be trapped. Urinals to be reconstructed and supplied with water.

Lastly, the deficiencies in accommodation mentioned above, but especially that of married quarters, should be supplied as soon as practicable.

*Weedon Garrison Hospital.*

This hospital is situated on the slope below the upper barracks, in an airy exposed situation. It consists of a centre and two wings, the former being two stories high, the latter one story. One of the wings contains the kitchen, pack-store, coal-store, and wash-house. The other contains a ward, two water-closets, and a large bath-room. On the ground floor of the central block there is a nurse's room, steward's room, and two wards. Upstairs there are three wards and the surgery. The total regulation accommodation is for 40 sick, distributed as follows :—

| Wards. | Present Regulation Number of Beds. | Number at 1,200 Cubic Feet per Bed. | Deficiency of Bed Spaces. |
|---|---|---|---|
| No. 1 - - | 7 | 4 | 3 |
| „ 2 - - | 7 | 4 | 3 |
| „ 3 - - | 7 | 4 | 3 |
| „ 4 - - | 7 | 4 | 3 |
| „ 5 - - | 7 | 4 | 3 |
| „ 6 - - | 5 | 2 | 3 |
| Total - | 40 | 22 | 18 |

The present wards contain space for only 22 beds instead of 40, showing a deficiency of 18 bed spaces.

The atmosphere of the whole hospital at the time we inspected it was in a most offensive condition, partly from the want of any sufficient means of ventilation, and partly from the defective condition of the water-closets. Each ward has a glass louvre in the window, and a few holes over the ward door. The louvre is covered by a wooden shutter, which is in some wards overlaid by the window blinds, so that the louvre cannot be opened unless the window is pulled down. This method of ventilation is insufficient, and each ward will require a shaft and inlets of the usual construction. Two inlets will be required for each ward, except No. 6, for which one inlet will be sufficient.

The wards are heated by the old pattern grate, which should be remodelled to heat part of the admitted air. It will be necessary also to ventilate the staircase by a shaft nine inches square, carried from the ceiling through the roof, and by perforated panes of glass in the windows.

On the upper floor there is a lobby, which is quite useless, and the whole space of which might be gained for ward space, or for some other useful purpose, by altering the position of the ward door.

The ward windows are on one side only, and each ward has one window, except ward No. 3, which has four windows.

The lighting at night is effected by a gas-burner in each ward, but none of the burners are ventilated. To remedy this defect, a proper funnel and tube connected with the chimney should be placed over each burner.

In the floor of the bath-room already mentioned, is a large sunken bath, like a tank, requiring, probably, from 700 to 800 gallons of water to fill it. It is not only utterly useless for its object, but tends to deteriorate the sanitary condition of the building, from always containing a certain quantity of stagnant water, and from the risk of part of this water draining into the subsoil under the wards. Indeed, so powerful an odour pervaded the adjoining ward, that part of the flooring was taken up to ascertain whether there was a drain passing underneath. This bath-room should be entirely remodelled, the present bath filled up, and a proper bath, with hot and cold water laid on, should be provided. A hospital ablution table, with tank, basins, and water laid on, should be constructed.

There is space enough for this, and proper ablution accommodation is essentially necessary, as the only place for the patients to wash in is the cold damp hospital wash-house in the opposite wing. When the bath-room is re-arranged it should be ventilated by a louvre in the roof.

There are no sufficient means for washing and drying the hospital linen. The wash-house is inadequately supplied with the means of doing so. It requires fixed tubs, with water laid on, gratings, and ventilation, and proper means of drying; but it would be more conducive to the health of the hospital to wash the hospital linen elsewhere.

There are two water-closets on the ground floor of one wing, in so defective a condition that the smell from them can be distinctly traced into the adjoining ward.

This defect appears to arise partly from want of water, and partly from their construction. The only remedy is to reconstruct them, to see that they are properly drained, and to provide a constant water supply.

There is a privy in the yard drained into a cesspit close to the hospital. It requires to be converted into a water latrine and drained, and the cesspit abolished.

The whole drainage and water supply of this hospital should be improved along with that of the barrack, for in all essential points both are equally defective.

There is an ash-pit in the yard in a position where it is likely to influence injuriously the purity of the air. It should be removed and provision made for collecting and taking away the hospital refuse daily.

Besides additional ward space, Weedon hospital requires a provision store; the only substitute for which at present is a small cupboard in the kitchen, another small cupboard in the surgery being used for keeping medical comforts. The pack store requires racks, and more shelves are required for the store-room. There is no accommodation for the sick of soldiers' families; indeed the hospital accommodation, even in the present over-crowded state of the wards, is so deficient, that occasionally temporary hospital accommodation has to be provided in the adjoining infantry barracks, an expedient to be deprecated for obvious reasons.

Nothing short of extending this hospital on an improved plan will supply the required ward space for the strength in barracks. So far as the existing buildings are concerned, *we would sum up our recommendations as follow*:—

1. Reduction of the number of beds in each ward to the extent specified.

2. The ventilation of each ward by shafts and inlets as described. Ventilation of the staircase by a shaft and perforated glass panes. Ventilation of the bath-room and wash-house through the roof.

3. Reconstruction of the ward grates so as to warm part of the admitted air.

4. A ventilated gas-burner to be introduced into each ward.

5. Bath-room to be re-arranged, the existing bath filled up, a proper bath, with hot and cold water laid on, to be provided, and a proper hospital ablution table.

6. Wash-house to be provided with fixed tubs and water laid on, gratings for the feet, and a laundry stove.

7. Present water-closets to be reconstructed with improved soil-pans and a constant water supply. Privy in the yard to be reconstructed as a water latrine with drainage, and the cesspit to be filled up.

8. The hospital drainage and water supply to be improved along with those of the barrack, and all drains to be trapped. Hospital ash-pit to be abolished, and the refuse collected and removed daily.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, June* 3, 1859.

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# LIVERPOOL DISTRICT.

SIR,

IN conformity with our instructions we have visited the North Fort and Rupert House barracks, Liverpool, the barracks in Chester Castle, and the New Cavalry and Infantry barracks at Owlerton, near Sheffield, and we have the honour to transmit the following Reports regarding them.

## I. LIVERPOOL.

### 1. NORTH FORT BARRACKS.

These barracks are situated at the north-western extremity of Liverpool docks, behind a battery erected for the protection of the river. They close in the rear of the battery, and are constructed so as to protect it against surprise.

There is one range of soldiers' barracks pierced in the centre by the gateway. At one extremity of this range is placed the officers' quarters, built at right angles, and at the other extremity is the hospital.

The barrack-rooms are on two floors. A central passage and stone staircase give access to two rooms on each floor running from front to back of the buildings. The roof is of brick arches supported by iron girders and covered with asphalte. On the upper floor there is a serjeant's room taken off the passage between the two men's rooms.

The barrack-rooms have wooden porches inside to cover the doors, which are in the centre of the length of the room opposite the fire-place, which latter is of the old construction, and wastes much heat. At one end of the room are two windows, and at the other are loopholes and a small window protected by iron shutters.

Each room is intended to accommodate 25 men at an average cubic space of about 460 feet per man. The following table shows the present regulation accommodation in the men's rooms contrasted with what it would be at 600 cubic feet per man:—

| Rooms. | Total present Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 8 | 200 | 160 | 40 |

By reducing the number of men per room, from 25 to 19, a trifle more than 600 cubic feet per man would be given, but considering the isolated exposed position of the fort, 20 men per room may be fixed as the regulation number.

There are no special means of ventilation for any part of the building. In consequence of the brick-arched roof there would probably be considerable difficulty in making the usual ventilating shafts; we would therefore propose to make the best use we can of any opportunities for ventilation which the buildings may afford. We would propose, first, to ventilate each staircase by a ventilating lantern to be placed over an opening in the roof of the staircase already existing, and to place panes of perforated glass in the stair window; we would further propose to place one of the largest sized silk flap ventilators in each chimney. We would propose to provide the necessary inlets for fresh air, one at each end of the room, close to the ceiling.

In order to make the chimney act as an outlet it would be necessary that each fire-grate be altered so as to contract the throat of the chimney below, and at the same time to provide for warming part of the air admitted. The opening for admitting air so warmed should be placed rather nearer to the ceiling, and as far from the silk flap ventilator as possible. There is gas in the barrack-rooms, but the burners are not ventilated. A funnel and tube of large dimensions.

should be carried from the gas burner into the chimney of each room, so as to obtain the twofold advantage of removing the gas vapour and increasing the amount of outlet for impure air from the rooms.

In order to obtain the benefit of this not very satisfactory method of ventilation, it is necessary that all the parts of it, including the remodelled grates, should be carried out. The serjeants' rooms should also have a silk flap ventilator into the chimney.

The guard-room requires ventilation by a silk-flap ventilator, an inlet for air, and a remodelled grate, combined in the same manner as in the barrack-rooms. The cells appear to have sufficient ventilation.

The library and school-room are over the entrance archway, and are formed out of one barrack-room, with a partition thrown across ; one part is warmed by a fire-place, the other by a stove. Both rooms should have inlets for air, and the school-room should have a large silk flap ventilator in the chimney.

The staff serjeants' quarters should have a ventilating funnel and tube from over the gas carried into the chimney.

There is a serjeants' mess-room over the guard-room, and a mess kitchen; the mess-room requires a silk flap ventilator, and an inlet for air like those of the barrack-rooms.

There is one cook-house ; it is a long narrow apartment, with boilers of the ordinary elliptical pattern ; there are no other means of cooking. A roasting oven is required.

The women's wash-house has fixed tubs, but requires a grating to stand on. It is under the barrack store. It should have an opening near the ceiling to carry off the steam. A drying and laundry stove is also required.

The men's ablution-room is too small ; it has a slate ablution table with a bead and pegs, but there is no bath. Space for one bath might be found in some other part of the fort.

The privies are dark and offensive, with the usual ladder construction of seat. The soil falls into a sewer into which the tide has access, and removes periodically a certain proportion.

These privies should be altered into water latrines, with a shallow receptacle on Macfarlane's principle, in which water should always stand. Adequate light and ventilation with proper divisions of seats should also be provided.

There is an ash-pit close to the privies at the end of a narrow passage. It should be abolished, and an iron cart substituted, which should be made available for collecting and removing both barrack and hospital refuse.

The water supply is ample, being derived from the town supply.

The ditch in front of the gate of the fort has no drainage, and is stated to be very offensive occasionally. It should be properly drained.

*The following are the Sanitary Improvements we would recommend for these Barracks :—*

1. Reduction of the numbers of men from 25 to 20 per room.

2. Ventilation of each barrack-room by an Arnott's silk flap ventilator in the chimney, by two inlets for air, and a remodelled grate. Ventilation of the staircases by a ventilating lantern and perforated panes. Gas-burners to be ventilated. Guard-room to be ventilated in the same manner as the barrack-rooms. Library, school-room, and serjeants' mess to be ventilated as described. Serjeants' rooms to have ventilators for the gas burners, and Arnott's ventilators.

3. A roasting oven to be introduced into the kitchen.

4. Women's wash-house to have gratings and ventilation, and a laundry and drying stove.

5. One bath, with water laid on, to be provided.

6. Privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation ; ash-pit to be abolished.

7. Ditch to be drained.

*North Fort Hospital.*

The construction of this hospital differs in some respects from that of any other similar building we have seen, and its form and arrangement appear to have been considered more with reference to the shape of the fort than to the recovery of the sick. It is an irregularly built, gloomy, and unventilated structure, standing in a narrow confined yard, at the north-west end of the soldier's barracks. On the ground floor are the kitchen and serjeants' room, both placed on one side of a central passage and staircase ; on the other side are the surgery, a water-closet, and the itch ward, into which access can only be obtained from another entrance, and at the end of the passage is a second water-closet. Both closets are dark, and there is no ventilation for either, except into the passage, and no ventilation for the passage and staircase except into the wards or into the outer air by a door, and by a window over it.

There are three wards, a pack store, and a bedding store, and a water-closet up stairs, but the upper passage is equally devoid of through ventilation as is the lower. The pack and bedding stores are both damp, and require means of keeping their contents dry ; an allowance of coal would answer the purpose.

The accommodation in these wards is as follows :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 9 | 4 | 5 |
| 2 | 9 | 4 | 5 |
| 3 | 6 | 3 | 3 |
| Total - | 25 | 11 | 13 |

These wards ought on no account to have more than 11 beds allotted to them, and as there are no means of extending the accommodation, it would be advisable to provide additional ward space adjoining the recruiting barrack at Everton, or in some equally eligible situation.

Notwithstanding the serious structural defects, and the overcrowding in this hospital, none of the wards are ventilated, and as the roof is arched of brick, it would be difficult, if not impossible, to provide suitable outlets for the foul air. The only practicable way of obtaining an outlet is the one we have recommended for the barracks, namely, introducing a large sized Arnott's silk flap ventilator into each ward chimney, and to place two of Sherringham's medium-size ventilators in each ward, close to the ceiling, to answer as inlets for fresh air. The fire-grate should also be altered to warm part of air admitted, care being taken to place the inlet for warmed air as far as possible from the Arnott's ventilator, and rather nearer to the ceiling. Another method of increasing the ventilation would be to place ventilating funnels and tubes over the gas burners in each ward, to convey the products of combustion into the chimney.

Under one of the wards is placed the kitchen. A shaft cannot be provided for ventilating it ; instead of which a perforated glass pane should be placed in the upper sash of each of the windows. It is absolutely necessary that ventilation should be supplied to the water-closets by means of a direct communication with the outer air, and, if possible, more light should also be introduced.

In order to afford some ventilation to the staircase and passages, we would recommend the introduction of perforated glass panes into the upper sashes of all the windows.

In a small yard close to the hospital door is placed the ash-pit. It is very narrow and very deep, and appears never to be thoroughly emptied. It should

be abolished, and provision made for removing the hospital refuse, with that of the barracks, daily.

There is no proper ablution-room; the wash-house is used as a bath-room, but it has only a moveable slipper bath. The wash-house might be converted into a proper bath and ablution room, having a covered means of access from the hospital, if another small wash-house could be obtained.

This hospital occupies so very confined a space, its plan is so defective, and the amount of accommodation it can afford, namely, that for 11 patients, so small, that we cannot advise much expense to be incurred in improving it, and any extension of it would be impracticable.

If the accommodation be limited to 11 beds instead of 25, the present number, the building might be rendered more suitable for sick than it is by the improvements we have pointed out, and the remaining sick should be provided for elsewhere.

*The Improvements are as follow:—*

1. Reduction of the number of inmates in each ward to the extent shown in the table.
2. Ventilating each ward for the reduced number of sick by a silk flap ventilator in the chimney, by two of Sherringham's ventilators, and by remodelling the fire-grates to warm part of the admitted air in winter.
3. Ventilating the gas-burners by funnels and tubes into the chimney.
4. Ventilating the water-closets to the external air, and if possible affording them some light.
5. Ventilating the staircase and passages by perforated glass panes in the top range of the upper window sashes; ventilating the kitchen by perforated glass panes.
6. Abolishing the ash-pit, and providing for the daily removal of the hospital refuse.
7. A bath-room with one fixed bath, hot and cold water laid on, and an ablution table to be provided.

### 2. Rupert House Recruiting Barrack, Everton.

This is an ordinary dwelling-house, situated on high ground on the north-east side of Liverpool, which has been taken on lease for 21 years, and is used as a depôt for recruits.

Thirteen of the rooms are appropriated as barrack-rooms, and the total regulation accommodation is for 148 men and four staff serjeants. Some of the rooms are overcrowded, as will be seen by the following table:—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Ground floor: | | | |
| 1 | 10 | 9 | 1 |
| 1 | 11 | 9 | 2 |
| 1 | 11 | 10 | 1 |
| 1 | 10 | 8 | 2 |
| 1 | 17 | 13 | 4 |
| First floor: | | | |
| 1 | 8 | 6 | 2 |
| 1 | 12 | 9 | 3 |
| 1 | 3 | 3 | — |
| 1 | 8 | 8 | — |
| 1 | 16 | 13 | 3 |
| 1 | 13 | 10 | 3 |
| Second floor: | | | |
| 1 | 11 | 9 | 2 |
| 1 | 12 | 12 | — |
| 1 | 6 | 4 | 2 |
| Total - | 148 | 123 | 25 |

By removing 25 men from the construction in the proportions given in this table, an average space of as nearly as possible 600 cubic feet per man will be given for the remaining 123 men. The occupation of the house as a recruiting barrack must necessarily be very irregular, and it would be advisable to distribute the recruits in the rooms, so as to give them plenty of cubic space.

The rooms are most of them very good and well suited for their purpose. They are light, spacious, and clean, but not sufficiently ventilated.

We would recommend that each room be provided with a large Arnott's silk flap ventilator into the chimney, and a perforated zinc pane in the upper sash of each window.

In two rooms there are ventilating openings into closed-up chimneys, but the ventilators are shut up. The present ventilators should be removed, and permanent openings substituted.

The large central staircase should be ventilated through the roof, and by a few perforated glass panes in the windows.

An ablution room has been made in a cellar in the basement of the house. A fixed bath has also been put up, but in a position to interfere with a portion of the ablution table, and with no partition round it. It should be removed near to one of the windows, and provided with a proper partition, bench, pegs, &c. The kitchen range is out of repair, and requires improvement.

The men's privy is a water latrine in which the water stands—it is too deep. The serjeants' privy empties into the ash-pit as its cesspit; the ash-pit should be abolished, and an iron cart substituted; the serjeants' privy should be converted into a water-closet. A urinal is required.

The water supply, derived from the town mains, is sufficient.

*The following are the Sanitary Improvements required for this Barrack:—*

1. Spreading the recruits through the rooms to give as near as may be 600 cubic feet of space.
2. Introducing a large silk flap ventilator into the chimney of each barrack-room, and to open permanently the ventilators into the closed-up chimneys in two of the rooms. Introducing a pane of perforated zinc into the upper row of each room window, and into the upper row of each passage and stair window.
3. Providing a ventilating funnel and tube to each gas burner.
4. Re-arrangement of the bath accommodation as recommended above.
5. Repairing the kitchen range.
6. Conversion of serjeants' privy into a water-closet. Providing a urinal. Abolition of ash-pit, and substitution of iron cart for it.

## II. CHESTER CASTLE.

### Infantry Barracks.

Chester Castle is situated at the southern extremity of the city of Chester, on elevated ground overlooking the river Dee. The situation generally is open, airy, and healthy, but the buildings of the city come close up to the walls on one side, and almost enclose the hospital.

The assize courts occupy the centre of the castle yard. On the south-west of them are barrack buildings known as the upper ward, and on the north-eastern side are the buildings of the lower ward.

The upper ward barracks were erected in 1835, and those of the lower ward in 1809.

The area within the barrack enclosure amounts to 4A. 2R. and about 30P. The subsoil is new red sandstone rock, and the means of natural drainage are amply sufficient.

The buildings of the upper ward consist of a single block of barrack-rooms facing towards the south-west and close to the parapet. Close to these, and

running at right angles are other buildings used as barrack offices, kitchen, privies, &c.; lower down, and running parallel to the barrack block, are the officers' quarters.

The buildings of the upper ward generally are simple and well arranged for securing external ventilation. Those of the lower ward are, however, more complicated, and by no means so well ventilated externally. Part of them face the court of the castle, and are parallel and opposite to the officers' quarters of the upper ward; part of them are built at right angles so as to form two sides of a narrow court behind, completed by high walls, and containing the kitchens, ablution houses, and the military prison, part of which is used as a school. Close to the latter building is the castle wall, outside which are the houses of the town and the hospital.

The present regulation accommodation in the soldiers' barracks is for 291 non-commissioned officers and men, distributed between the wards and rooms as follows :—

| Barrack Rooms. | Total present Regulation Accommodation in Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Upper Ward : | | | |
| 1 | 16 | 16 | — |
| 2 | 20 | 20 | — |
| 3 | 20 | 20 | — |
| 4 | 16 | 16 | — |
| 5 | 16 | 15 | 1 |
| 6 | 20 | 19 | 1 |
| 7 | 20 | 19 | 1 |
| 8 | 16 | 15 | 1 |
| Lower Ward : | | | |
| A. | 20 | 18 | 2 |
| B. | 29 | 26 | 3 |
| C. | 20 | 18 | 2 |
| D. | 35 | 31 | 4 |
| E. | 10 | 7 | 3 |
| F. | 13 | 11 | 2 |
| H. | 13 | 11 | 2 |
| Total - | 284 | 262 | 22 |

The barrack-rooms, as a whole, are very little overcrowded, and the overcrowding is chiefly confined to rooms in the lower ward, the external ventilation of which is the most defective.

The rooms in the *upper ward*, as already stated, are in a single block, consisting of a basement, in which is situated the armoury of Chester Castle, and two floors of barrack-rooms above. The rooms are entered by a central door, giving access right and left to a short glazed corridor, and to a stair in front, giving access to the men's rooms above through a similar glazed corridor.

On each floor there are four barrack-rooms. Two of these rooms on each floor are entered from the end of the corridor, and two from its side. The end rooms have windows at their opposite ends, so that by opening them a thorough ventilation can be obtained. The rooms entering from the side of the corridor have windows only on one side, and are not so well ventilated.

The end rooms on the lower floor have no means of ventilation, except the doors, windows, and fireplaces. The end rooms on the upper floor have openings in the ceilings. The other rooms, both above and below, have openings into the passages, but none to the external air.

The ventilation in all of the rooms is defective, and should be improved by carrying a shaft from the ceiling of each room to above the roof of the building. Each of the end rooms should have two inlets for air of the usual construction placed close to the ceiling. In the upper end rooms the outlet shaft might be carried up from one or more of the existing openings near the middle of the ceiling, the others being closed up.

All the other rooms, except the end rooms, will require one inlet to the outer air on one side, and the other inlets to the passage may be left as they are, provided the passages themselves be properly ventilated by inserting a pane of perforated glass, or of perforated zinc, into the top row of panes in the upper window sashes.

To complete the ventilation, it will be necessary to remodel the fire-grates to warm part of the admitted air in winter. Those at present in use are of the old construction, and waste much fuel which might be easily employed in adding to the warmth of the rooms, and facilitating the ventilation.

There is a small serjeants' room taken off the landing on each flat. These rooms should each have a silk flap ventilator put into the chimney.

The rooms in the *lower ward* barrack buildings are entered from spacious lobbies, passages, and staircases. A part of the passages is dark, and without sufficient ventilation. The rooms generally have some means of renewing the air. Those on the ground floor have hollow beams with openings on the lower sides. These beams would serve the purpose of inlets if the present openings were closed, and openings made in the sides, and covered with louvres, so placed as to turn the air up to the ceiling. Each of these lower rooms would require an outlet shaft or shafts of the proper sectional area to be carried from the corners of the ceiling to above the roof.

The rooms above have simply openings through the ceiling for ventilation. This plan is defective, and we would advise that one or more of the openings nearest the centre of the ceiling should be connected with an outlet shaft and carried above the roof. Two inlets for air, of the usual construction, placed close to the ceiling would be required in each of the upstairs larger rooms, but one inlet would be sufficient in the present 10 and 13 men rooms.

All the barrack-room grates in the lower ward require to be reconstructed to warm part of the admitted air.

Out of the dark passages of these buildings a number of small rooms open, which are used for a variety of purposes, such as serjeants' rooms, offices, &c. All of them are without ventilation, and all should be provided with silk flap ventilators into the chimneys. Underneath these rooms, in the basement of the lower ward barracks, are the workshops, shoemakers, tailors, &c. They are dark, damp, unwholesome, and quite unfit to be occupied by human beings. We would recommend their being immediately evacuated. In the same basement is a dark room intended for a serjeants' mess. It is at present used as their mess kitchen, and a barrack-room up-stairs is set apart for the mess. The room in the basement is unfit for a mess-room, and ought not to be re-occupied for such a purpose.

All the passage and staircase windows in this part of the barracks require a pane of perforated glass or of perforated zinc put into the upper line of panes in each window.

None of the barrack-rooms are lighted with gas, although gas is laid on within the boundary. Each barrack-room should have one or more burners according to its dimensions. All the burners in the lower floor rooms would require to be ventilated by funnels and tubes carried either into the chimney, or, what would be better, terminating within the air shaft. If the burners in the upper floor rooms were placed under the openings of the shaft, recommended to be carried up from the ceilings, no further ventilation for the burners would be required.

There is no day-room for the men in these barracks, and there are no cleaning-rooms nor drill sheds.

There is a library and school-room both in one. The room is lighted with gas, and it is partly ventilated by inlets at the ceiling. It requires a shaft for an outlet, and a remodelled grate similar to those in the barrack-rooms.

There is one damp dark store-room in the basement of the lower ward. A better store-room is required.

There are two men's lavatories, one for the upper ward barracks and one for those of the lower ward. The ablution tables require beads, and there are neither gratings nor pegs. Authority has, however, been given for supplying these deficiencies. The town water supply should be laid on to both lavatories. The one belonging to the upper ward is dark and unventilated. It requires skylights and louvres in the roof. The lower ward ablution-room requires a louvre in the roof.

There are no baths. Three with water laid on are required.

Behind the buildings of the lower ward is the women's wash-house for the whole barracks. It requires fixed tubs and a drying stove.

Close to the wash-house is a good cook-house with boilers, but it has no other means of cooking. There is a similar cook-house at the end of the barrack block of the upper ward. It requires skylights in the roof. Both cook-houses require ventilated roasting ovens.

Water is derived partly from the works of the water company, and partly from two pump wells. The supply appears to be sufficient for all sanitary purposes. Two fire-plugs, one for each ward, are stated to be required.

The latrines are defective in construction and accommodation. There are two of them, one for each ward, and there are in all 13 seats for 284 men. Both latrines are flushed, but as they have no receptacle in which water stands they are very offensive. They should be enlarged and reconstructed as water latrines on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation. The adjoining urinals also require reconstruction, with water laid on for cleansing.

The water-closet in the ordnance storekeeper's house has no water except rain water, which is not sufficient in amount to keep it clean. A constant supply could be easily obtained from a neighbouring cistern.

In front of the upper ward barrack-rooms is a cellar used as an ash-pit. It ought to be abolished and the refuse removed daily.

One of the drains from the upper ward opens through the wall of the castle and spreads its contents over the grass close to the ball court where the men exercise. This requires to be remedied by carrying a proper drain from the present outlet to the river Dee, which is close at hand.

The guard-room requires a shaft and inlet, and a remodelled grate to improve its warming and ventilation.

There is no canteen, and there are no quarters for married soldiers in barracks.

*The Sanitary Improvements required for Chester Castle Barracks are as follow :—*

1. Reduction of numbers of inmates in the barrack-rooms to the extent stated.

2. Improvement of the ventilation and warming of all the barrack-rooms by shafts, inlets, and remodelled grates, as described. Ventilating all the non-commissioned officers' rooms by silk flap ventilators into the chimneys. Ventilating and warming the guard-room by a shaft, inlet, and remodelled grate. Improving the ventilation of the school-room and library by a shaft and remodelled grate. Ventilating all the passages in the soldiers' barracks by perforated glass or zinc panes in the windows.

3. Workshops in the basement of the lower ward barracks to be abandoned.

4. Barrack-rooms to be lighted with gas-burners ventilated as described.

5. Town water supply to be laid on to the lavatories. Upper ward lavatory to be lighted and ventilated through the roof. Lower ward lavatory to be ventilated through the roof.

6. Three baths, with water laid on, to be provided for the barracks.

7. Cook-houses to be supplied with ovens. Upper ward cook-house to be lighted by skylights.

8. Women's wash-house to be fitted up with fixed tubs and a drying stove.

9. Latrines to be reconstructed with water receptacles on Macfarlane's principle. The accommodation to be extended ; divisions of seats, half-doors, light, and ventilation to be provided. Urinals to be reconstructed ; ordnance storekeeper's water-closet to be better supplied with water ; defective drainage from the upper ward to be improved as suggested ; ash-pit in front of the upper ward barracks to be abolished, and provision made for daily removal of the barrack refuse.

Lastly, the deficiencies in these barracks bearing on the health and comfort of the men are as follows : — Day-rooms, covered drill shed, cleaning-rooms, canteen, and married soldiers' quarters.

### *Chester Castle Hospital.*

This building consists of a two-story detached house situated outside the Castle walls, and facing a public street. It has a central passage and staircase giving access to the wards and offices. On the ground floor is the serjeants' room, surgery, a bedding store, and one ward ; up-stairs there are two wards running from front to back of the building, and having opposite windows at each end. A fourth small ward has been taken off the upper landing.

The total regulation accommodation is for 23 sick, but the wards are very much overcrowded, as will be seen from the following table :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 5 | 3 | 2 |
| 2 | 8 | 4 | 4 |
| 3 | 8 | 4 | 4 |
| 4 | 2 | 1 | 1 |
| Total - | 23 | 12 | 11 |

By giving little more than 1,000 cubic feet per bed this hospital can accommodate no more than 12 beds. If a little more than 1,200 cubic feet were exacted it would hold 10 beds only.

The first step to improve this hospital is to diminish this great overcrowding, which can only be done by obtaining more ward space. Unfortunately the enclosure within which the present buildings are situated is very limited in size, and the buildings can only be extended at the ends. To accommodate safely the present proportion of sick, the cubic contents of the hospital must be doubled at least, and in some way or other the additional space will have to be acquired, if the building is to be used for its present purpose.

None of the rooms are ventilated ; all of them, except ward No. 4, require shafts carried from the ceiling to above the roof of the buildings. No. 4 can be ventilated for one patient, which is all it ought to contain, by a silk flap ventilator into the chimney. Wards 2 and 3 require two inlets for fresh air, of the usual construction, one at each end close to the ceiling. Ward No. 1 requires one inlet. All the wards should have remodelled grates similar to those already recommended for the barrack-rooms.

The only means of lighting at night is by candles, although gas is at hand; a ventilated gas burner is required for each ward.

There are no means of ablution for either sick or convalescents, and the only bathing accommodation is a shower and slipper bath.

An ablution and bath room might easily be constructed by throwing out a projection behind the centre of the hospital over the covered communication leading to the kitchen.

As there are no water-closets for the sick the required accommodation might be provided in the same projection.

There are two very defective privies in the back yard which ought to be reconstructed as proper water latrines. The urinal is also defective, and requires reconstruction, with water laid on for cleansing.

The kitchen is in the back yard of the hospital. It would be much improved by having a proper hospital cooking range introduced.

A very offensive ash-pit adjoining ought to be removed.

Water is obtained from a tank, and the buildings are drained into the town sewers.

The great defect in this hospital is its small size in comparison with the force in barracks, and the existing evils will not be fully remedied until it is enlarged or a new hospital built.

*The Improvements required for the present Buildings are:—*

1. Reduction of the numbers of sick in each ward.
2. Ventilation of the wards as described.
3. A ventilated gas burner to be introduced into each ward.
4. A projecting building to be erected behind the hospital to contain an ablution and bath room, and a water-closet. Privies in the back yard to be reconstructed as water latrines. Urinals also to be reconstructed and supplied with water. Ash-pit in the hospital yard to be removed, and all the refuse taken away daily.
5. A new cooking range to be provided for the hospital kitchen.

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## III. SHEFFIELD.

### Cavalry and Infantry Barracks.

Sheffield barracks are of very recent construction, and are in many points superior to most other barracks in England; they are situated on the slope of a hill at Owlerton, about a mile and a half from the town, in an open airy situation, and are built round two squares, of which the upper square is occupied by infantry, and the lower square by cavalry. Below the cavalry square is the provost establishment, and still further down the hill, outside the boundary wall, married soldiers' quarters are being erected upon much the same plan as the excellent married quarters at Preston. The riding school stands behind one side of the cavalry square. The hospital is placed at the upper end of the enclosure at right angles to and near the officers' quarters, which occupy the upper side of the infantry square, and front to the public road.

The means of natural drainage are ample. The buildings are of brick, faced outside with stone, and were finished a year or two ago.

The total regulation accommodation of both cavalry and infantry barracks is for 35 non-commissioned officers and 811 men.

The following table shows the present regulation accommodation compared with what it would be at 600 cubic feet per man:—

| Barrack Rooms. | Total present Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Numbers to be placed in each Room to give 600 Cubic Feet per Man. |
|---|---|---|---|---|
| Houses A. B. C. 6 Rooms, Nos. 1 and 2 in each house. | 90 | 78 | 12 | 13 |
| Nos. 3 and 4 in each house, 6 rooms. | 96 | 78 | 18 | 13 |
| F. No. 1. | 18 | 18 | — | 18 |
| G. No. 1. | 15 | 13 | 2 | 13 |
| „ 2. | 18 | 18 | — | 18 |
| H. No. 1. | 13 | 11 | 2 | 11 |
| „ 2. | 18 | 18 | — | 18 |
| „ 3. | 15 | 13 | 2 | 13 |
| J. Nos. 1 and 2. | 36 | 36 | — | 18 |
| L. M. N. O., 1 and 2 in each house, 8 rooms. | 120 | 104 | 16 | 13 |
| Nos. 3 and 4 in each, 8 rooms. | 128 | 104 | 24 | 13 |
| P. No. 1. | 18 | 18 | — | 18 |
| Q. No. 1. | 29 | 29 | — | 29 |
| R. No. 1. | 12 | 12 | — | 12 |
| S. Nos. 1 and 2. | 42 | 40 | 2 | 20 |
| T. No. 1. U, No. 1. | 42 | 38 | 4 | 19 |
| U. No. 2. | 12 | 12 | — | 12 |
| V. Nos. 1 and 2. | 42 | 26 | 16 | 13 |
| X. No. 1. | 29 | 29 | — | 29 |
| Y. No. 1. | 18 | 18 | — | 18 |
| Total | 811 | 713 | 98 | — |

The total present accommodation in this barrack is for 811 men, but at the time the return was made to us, the number of men in barracks exceeded the construction by 82, in order, as was stated to us, to obviate the necessity of billeting.

The amount of cubic space per man allowed by the construction differs considerably in different houses; the smallest amount is 369 cubic feet, and the largest is as high as 703 cubic feet. As there are other reasons besides the cubic space which determine the number of men put on the construction, especially in cavalry barracks, we have in all cases in the preceding table, in which the construction exceeds 600 cubic feet, assumed the numbers in the rooms as those best adapted for regimental purposes, while in every case where the amount falls short of 600 cubic feet we have indicated the number of men each room ought to contain.

The deficiency, therefore, of accommodation for 98 men refers solely to those rooms in which the construction gives less than 600 cubic feet per man. Were it possible to distribute the men equally the deficiency of accommodation would be that required for about 75 men.

We would recommend that the number of men per room be in future those we have given in the last column of the table.

The rooms on the two sides of the infantry square are in blocks divided into houses; each house contains two rooms on the ground floor, with a passage between, and two on the upper floor, with the staircase and a serjeants' room between.

Off the staircase, a few steps below the upper landing, there is a door opening into a broad outside gallery extending the length of the buildings, and which gives access from one house to another on the upper floor. Each lower room has a serjeant's berth partitioned off.

The third side on the infantry square, and the three sides of the cavalry square, have rooms over the stables. The passages leading to the rooms are between every two stables, and each passage gives access to two rooms on the upper floor and a serjeants' room.

The rooms are spacious and generally well lighted. They vary from 11 feet 4 inches to 12 feet in height; most of them have four windows, two on each side, with a distance between the opposite windows of from 31 to less than 34 feet, and some of the larger rooms have five, six, and ten windows per room.

The rooms have all had a certain amount of ventilation provided in the structure by means of a shaft carried up in the chimney breast of each barrack-room. This shaft is about 7 inches by 5½ inches in area; but the aperture into the rooms is too small, and being besides covered with a perforated plate, which closes a great part of the area, the outlet for foul air is not sufficient. The cover should be removed, and the opening enlarged to admit of a wide wire grating, which should give a clear area of ventilating outlet at least equal to double the area of the shaft. There are no inlets for pure air except from the passage by openings over the top of a wooden porch covering the doors. These inlets are not sufficient, and an additional inlet from the open air close to the ceiling, between the windows, should be constructed at each end of the room. A large Arnott's silk flap ventilator should also be placed in every barrack-room chimney to increase the area of outlet.

The grates are constructed on a different plan from any which we have seen; the sides and top are inclined so as to throw a large amount of radiant heat into the room, but much of the heat of the fire is lost up the chimney which might be rendered useful for supplying warm fresh air to the rooms in winter were the flues remodelled to enable this to be done.

The serjeants' rooms have no ventilation, they should be provided with Arnott's silk flap ventilators. All the rooms are lighted with gas, but none of the burners are ventilated, and the fittings are reported as being extremely defective.

It would increase the general ventilation of the rooms to carry a ventilating tube from above each gas burner, and to turn the end of it into the chimney.

The stables are too dark. They have ventilation by small shafts over each horse carried up in the wall; the gratings which cover the shafts should be removed, and additional inlets for air should be provided.

The block of buildings which forms the lower side of the infantry square has its upper floor on a level with the parade ground, from which it is separated by an open area, and in front of the building, under the parade ground, are a series of arches opening into the area, and intended for the reception of ashes and manure. The position of the manure and dust heaps under the windows of the rooms, and without circulation of air, is very objectionable, besides which, from their construction, they would be emptied with difficulty. We are of opinion that they ought to be done away with as places of deposit for refuse of any kind, and that provision should be made for removing the manure, daily, either altogether beyond the walls, or that a dung pit should be provided in some less objectionable site within the boundary.

The ablution-rooms require additional light by means of skylights in the roof, they have no bead to the table, and no pegs, benches, nor gratings. Gratings have been authorized, but the other defects should also be supplied. These ablution-rooms are sufficiently ventilated through the roof. There are no baths; eight are required for the strength in barracks.

The cook-houses also require additional light to be given through the roof. They have the ordinary boilers, and brick ovens.

The privies are of the ordinary ladder construction, without divisions, and have a deep trough flushed out. The quantity of water they require is enormous, and they are nevertheless offensive. Latrines on Macfarlane's principle, with water always standing in them, would be much better, and ought to be introduced, instead of the present defective arrangements.

Urinals are placed beside the privies; they are of porous stone of the ordinary form. They require water for cleansing; they are not of the most improved construction.

The ash-pits are far too deep, and should be abolished, and iron carts substituted.

There are four women's wash-houses, two for cavalry and two for infantry. They have fixed tubs, but without water laid on; there are no gratings, though some are authorized. These wash-houses are dark and unventilated, and require skylights and louvres, &c. in the roof. There are no drying stoves; one should be provided for each wash-house.

The rain water which falls on the roofs is retained in 19 tanks. There are also 18 wells, besides which the barracks receive water from the town water supply.

There is a serjeants' mess-room and kitchen for infantry and cavalry; both have ventilation.

There are two excellent drill sheds, each 84 feet long by 36 feet wide. They are situated on the east and west ends of the south range.

The following are the workshops belonging to the barrack:—Two armourers', one saddler's, two tailors', two farriers', and two shoemakers'. They all appear to be ventilated on the same principle as the barrack-rooms, and would be improved by enlarging the openings of the outlets as recommended for the barrack-rooms.

The provost establishment has the cells ventilated, but the ventilation is too much under the control of the prisoners. One of the slides by which the ventilation can be closed should be removed.

The riding school is too dark, it should have skylights in the roof; it has enough ventilation.

There are self-acting water-closets, of a bad construction, in the officers' quarters. They are liable to get out of order, and can only be repaired by the patentee after considerable delay. They are placed under the stairs, and practically ventilated into the passage, and the force of water does not keep them sweet. They should be reconstructed in a less objectionable position.

The canteen is good; the tap-room has shafts for ventilation and inlets over the doors; the passage windows should have perforated panes.

The chapel school is ventilated.

The guard-room has a shaft for ventilation, but requires an inlet for air.

Sheffield barracks as a whole are very good barracks, but in some sanitary details they require improvements such as we have pointed out, and which we here sum up:—

1. Reduction in the number of men in the barrack-rooms to the extent stated.

2. Improving the ventilation of all the barrack-rooms, workshops, library, &c., by enlarging the openings of the present outlet shafts, as recommended, by providing additional outlets by Arnott's silk flap ventilators in the chimneys, and additional inlets for air between the windows. Ventilating the serjeants' rooms by Arnott's silk flap ventilators. Improving the ventilation of the stables by additional inlets for fresh air. Covers of the cell ventilators to be removed. Inlets for air to be supplied to the guard rooms. Canteen passage windows to have perforated panes of glass.

3. All the gas burners to be provided with ventilating funnels and tubes into the chimneys.

4. Manure and dust pits in the arches under the upper parade ground to be removed, other ash-pits to be done away with, and iron carts for daily removal of the refuse to be introduced.

5. Ablution-rooms to have light through the roof, beads to the tables, gratings, and pegs.

6. Eight baths with water laid on to be provided.

7. Cook-houses to be lighted through the roofs.

8. Women's wash-houses to have light and ventilation provided through the roofs; water to be laid on to the tubs, gratings for the feet to be provided, and a drying stove put up in each wash-house.

9. Privies to be reconstructed as water latrines on Macfarlane's principle, with seats, divisions, half-

doors, light, and ventilation. Urinals to be supplied with water. Water-closets in officers' quarters to be removed from their present position, and reconstructed.

*Sheffield Barracks Hospital.*

The hospital is by no means of so good a construction as the barracks. Its plan and arrangements are very complicated, and tend to interfere with that thorough ventilation and lighting which are essential to the rapid recovery of the sick. The building is in two divisions, one for cavalry, the other for infantry. It contains some wards with windows at each end, the beds being arranged down the dead walls, so that the effluvia from the sick must pass over the intervening beds before they can escape by the windows. There are some wards having windows to the open air only on one side, with windows opening into a glazed passage on the other. Some portions of the interior are defectively lighted, and one orderlies' room has no direct communication with the external air, either for light or ventilation.

There are in all nine wards and 90 beds, arranged as follows :—

| Cavalry Hospital Wards. | Total present Regulation Number of Beds. | Total Number at 1,200 Cubic Feet per Bed. | Deficiency of Bed Space. |
|---|---|---|---|
| No. 1. | 11 | 8 | 3 |
| „ 2. | 11 | 8 | 3 |
| „ 3. | 10 | 8 | 2 |
| Infantry Hospital Wards. | | | |
| No. 1. | 11 | 8 | 3 |
| „ 2. | 9 | 6 | 3 |
| „ 3. | 11 | 8 | 3 |
| „ 4. | 9 | 6 | 3 |
| „ 5. | 9 | 6 | 3 |
| „ 6. | 9 | 6 | 3 |
| Total | 90 | 64 | 26 |

The present regulation bed space in these wards varies from 816 to 872 cubic feet, and to give an average of rather less than 1,200 cubic feet per bed, it will be necessary to remove three beds out of each ward throughout the building, except No. 3 ward of the cavalry hospital, in which the excess of beds is two. The arrangement of the beds unfortunately cannot be altered, and it will still be necessary to place the sick with their heads against the dead walls of the ward, and with such an arrangement we are of opinion that the wards should never contain a larger number of sick than those given in the column showing the accommodation at 1,200 cubic feet per bed.

The wards have Arnott's ventilators and shafts carried up in the chimney breasts, similar to those in the barrack-rooms, intended to act as outlets for foul air. The gratings should be removed from the openings of the shafts and the openings enlarged to double the area of the shaft, as recommended for the barrack-rooms. There are inlets for air over the doors, but as there is little fresh air within the building these inlets can be of very limited use in ventilating the wards. Two inlets, with perforated zinc cornices, should be provided from the outer air close to the ceiling of each ward.

The passages should also be ventilated by a shaft carried up from the ceiling through the roof, and perforated panes of glass in the windows.

Each ward is lighted by gas-burners, but none of them are ventilated. They require ventilating funnels and tubes carried into the chimneys. There are two ablution-rooms, one for each hospital. One of the ablution-rooms has a fixed bath, but it is not partitioned off from the room ; this should be done.

There are self-acting water-closets in projecting blocks behind the staircases. These are complained of as being complicated and apt to get out of order, to the detriment of the hospital service ; they should be reconstructed on a better plan.

There are privies in the yard behind the hospital ; they are flushed, but are nevertheless very offensive ; they ought to be reconstructed as water latrines on Macfarlane's principle.

An ash-pit behind the hospital should be abolished, and means provided for removing the refuse daily.

The pack store is in the basement, and is stated to be sufficient and dry.

The kitchen is also in the basement; it is too dark, on account of the depth of the front area.

There are itch wards in the yard, with a privy attached. This privy should be reconstructed as a water latrine.

The wash-house is little used, as the hospital washing is done by contract, and such being the case, we do not consider it necessary to make any recommendations regarding it.

There is no accommodation for the sick of soldiers' families ; perhaps the simplest way of remedying this defect would be to provide a suitable room at the new married quarters.

*The following are the Sanitary Improvements required for Sheffield Barrack Hospital :—*

1. Reduction in the number of beds in each ward to the extent stated above.
2. Improving the ventilation of each ward by enlarging the opening of the outlet shaft, and by providing inlets for fresh air. Ventilating the passages by shafts and perforated glass panes. Ventilating the gas-burners into the chimneys.
3. Bath to be partitioned off from the ablution-room.
4. Water-closets to be reconstructed on a better principle. Privies in the hospital yard to be reconstructed as water latrines. Ash-pit to be removed, and provision made for the daily collection and removal of the hospital refuse.
5. Wash-house to be improved as suggested.
6. A proper orderlies' room, with windows to the external air, to be provided for the infantry hospital.

JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.
*Barrack and Hospital Improvement Commission, July* 11, 1859.

## MANCHESTER DISTRICT.

SIR,

WE have the honour to transmit to you the following Report on the barracks of the Manchester district, with special reference to the matters contained in our instructions.

We have inspected the following barracks in Lancashire :—

1. Hulme, cavalry and artillery.
2. Salford, infantry.
3. Burnley, cavalry and infantry.
4. Bury, cavalry and infantry.
5. Stockport, infantry.
6. Ashton, cavalry and infantry.
7. Fulwood barracks, Preston, artillery, cavalry, and infantry.

Each of these barracks we proceed to report on separately.

### 1. HULME CAVALRY BARRACKS.

These barracks have regulation accommodation for 423 men, including non-commissioned officers.

They are situated at the outskirts of Hulme ; but

on three sides of the parallelogram occupied by the barracks, there is a densely built neighbourhood of houses and factories, coming close up to the boundary walls; and on one side only is the barrack yard open to the fields.

The stables have the barrack-rooms built over them, and extend along about half of each of the longer sides of the parallelogram, within a few yards of the boundary wall. Immediately outside the boundary wall on one side, and overlooking the barracks, is a large lofty mill, which interferes with the free circulation of air on that side; and over the boundary wall, behind the opposite range of barrack-rooms, are narrow streets of small cottage houses with double ranges of ash-pits, privies, and cesspools between them, and over these nuisances the air which supplies the barrack-rooms on that side has to pass.

A third side of the parallelogram is occupied by the canteen, riding-house, &c. Within the parallelogram, at the same end, is a line of buildings, in which are placed the officers' quarters, workshops, schools, library, &c.

The hospital is situated close to these buildings. Behind each range of barracks is a narrow, ill-paved, and defectively drained passage, across which, and immediately under the barrack windows, are the litter sheds. An open ash-pit and serjeants' privy are situated in the same line as the litter sheds. The space left between the boundary wall and the barracks is much too small, either for health or convenience.

These arrangements are by no means conducive to the healthiness of the barracks; but they cannot now be altered without obtaining possession of ground outside the boundary wall, which, in our opinion, it would be very advisable to do, if it could be accomplished.

The soldiers' latrines, kitchens, &c. are situated in separate buildings, on the same line as the barracks.

The large central square is unequally divided by temporary wooden stables extending across it, and nearly in its centre is a large, well-built, ablution house, with water tank, baths, foot pans, basins, &c.

The permanent buildings are all of brick. They were built in 1793. The soldiers' barracks were rebuilt in 1829, and the officers' quarters in 1841.

The ground occupied by the whole establishment is 7 acres 1 rood in area, and consists of gravel and clay. It is on the same level, and possesses the same natural means of drainage as the surrounding district. Formerly a noisome open brook used to run along one end of the ground. This brook is now arched over, and part of the barrack drainage goes into it; the ground so gained is within the barrack walls, and is used as a drying ground.

It is proposed, as we have been informed, to erect married soldiers' quarters on this ground. If the intention is to be carried out, it would be very advisable to leave a clear space for thorough ventilation between the ground over the brook and the floors of the rooms, to prevent any effluvia entering the buildings.

There are in all 40 soldiers' rooms and 12 serjeants' rooms in these barracks. Three of the latter are, however, misappropriated soldiers' rooms, which it has been found necessary to take from the men's accommodation, on account of the deficiency in non-commissioned officers' quarters, from the augmentation of the cavalry regiments.

The rooms, as already stated, are over the stables, a very objectionable arrangement. Half of the rooms face towards the barrack square, and half towards the boundary wall. Between the two ranges of rooms is the usual long, narrow, badly-lighted, and unventilated wooden corridor, with doors opening right and left into the soldiers' rooms close to the fire-places.

These corridors are, however, much superior in one respect to those in most other cavalry barracks, from having shafts the whole breadth of the corridor, carried up at intervals to the roof, where a large skylight is placed to admit light; but for want of ventilation, which could be easily supplied at these skylights, the smell in the corridors at night is stated to be at times most sickening.

There are two other skylights in each range, which are imperfectly used for lighting, as their light is not properly admitted into the corridor; we would advise plastered shafts to be carried up to each of these skylights from the corridor, as has been done with the others, and that every skylight should have a space below it, properly protected from the weather, to admit of a free current of air passing at all times up the shafts from the corridor. This would much improve the ventilation of the whole buildings.

The barrack-rooms are all of a size, and they contain each 10 men with a cubic space of 494½ feet per man. The total regulation accommodation, as compared with what the accommodation would be at 600 cubic feet per man, is as follows:—

| Rooms. | Total Regulation Number of Men. | Total Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 40 | 400 | 320 | 80 |

By placing eight men in each room instead of 10, the present number, a trifle more than 600 cubic feet per man will be allotted to each. The deficiency in accommodation is that for 80 men, but there are three rooms, capable of containing 24 men, misappropriated for serjeants' rooms. If these were restored to their proper use, the deficiency in accommodation would be for 56 men.

The whole of the barracks are sewered into the town drainage of Manchester, and none of the sewers pass under any of the buildings. The drains are stated to be all trapped.

The water supply is derived from six pump wells, and from three rain-water tanks.

These wells are in the immediate vicinity of the stables, and derive their water from the soakage of the surface-water in a district where the soil cannot be considered as free of organic matter.

The supply falls short at times, and a new well is being sunk at no great distance from the sewer brook already mentioned.

These wells are not necessary for supplying the barracks.

The town of Manchester has an excellent water supply, certain mains of which pass close to the barrack gate.

The canteen being an occupied dwelling, is supplied with this water. On a recent occasion, the well water became deficient, and the men had to procure water from the canteen, for supplying which the owner was fined 10*l.* by the city authorities.

As certain defects in the privies and drainage are intimately connected with this state of the water supply, we are decidedly of opinion that sufficient water for all sanitary purposes should, in future, be obtained from the corporation waterworks. The water is at the barrack gate. All that is required is to bring it inside.

Each stable is ventilated by a round hole at each of the four corners, as well as by the windows; but we do not consider these arrangements sufficient as far as regards the barrack-rooms above.

The disadvantage of barrack-rooms over stables is twofold, as regards ventilation. If the stables are not ventilated, and the ceilings are not absolutely impervious, the effluvia pass through the ceilings into the rooms above; and if they are ventilated solely by windows and openings in the walls, the effluvia, after escaping from the stable, pass in by the barrack-room windows.

To prevent both results, as far as practicable, it is necessary to ventilate the stable by shafts, or iron

pipes, carried above the roof of the building from each of the four corners of the stable, and this we beg to recommend in the present instance.

Each shaft should give an area of 12 square inches per horse, and should be carried up outside the stable to a height of 3 or 4 feet above the eaves.

Perforated glass should be put into the upper window panes of each stable, to supply fresh air.

The barrack-rooms above require ventilation, to effect which a shaft, with a sectional area of 12 square inches per man, should be carried up from the corner of each room above the roof, and protected by louvres.

There is an opening in the ceiling of each room, at present; but as it only enters the space under the slates, the ventilation is not sufficient.

Inlets for fresh air, protected by short perforated zinc cornices for diffusing the inward current, and with valves for regulating the current, ought also to be provided near the ceiling.

All the latrines are in a bad and offensive condition. They are a long way from the barracks. They are much too small, and too narrow. They are dark and foul; the receptacle is not properly constructed; and although they are connected with the town drainage by 9-inch pipes, there is not a sufficient water supply to keep them free of smell, or to keep the pipes free from obstruction.

The latrines require reconstruction, with a proper water receptacle and flushing apparatus, such as is used in the London cavalry barracks. They require more light, roomy buildings, and more seats, with divisions and half-doors, and there must be sufficient water to fill and flush them once or twice every day.

The urinals are not supplied with water for cleansing or flushing. This defect requires remedy.

There are two cook-houses, one on each side of the parade ground. Each is provided with ten boilers. But there are no means of roasting meat, and the buildings are very deficient in light.

Each kitchen requires a roasting oven, and glass louvres at the ends.

There is no laundry. There is a women's wash-house. It is dark from want of a skylight, which could be easily inserted; and it has no drying stove.

These barracks contain the usual cavalry barrack workshops. They are rather small, and they require ventilation. It would be desirable to convert the armourer's shop into a saddle-tree maker's shop, and to erect another armourer's shop.

The school-room is defectively ventilated. It requires a ventilating shaft at each end, and inlets for air protected by perforated zinc covers over the windows, or by perforated glass panes at the top of each window.

The ash-pits in these barracks are too close to the rooms. They ought to be abolished, and the whole barrack refuse collected and removed in iron carts, as recommended in other cases.

The stable manure depôts admit of much improvement. They should be paved, reduced in size, and arrangements made for the more frequent removal of the manure.

The guard-room is dark, and unventilated, and has a flagged floor.

The orderly room is complained of as too small, and a second room for clerks is considered necessary.

The whole buildings are lighted by gas, which is a great convenience.

There are no cleaning-rooms, and no covered sheds for drill.

*The following are the Sanitary Improvements required for Hulme Barracks:—*

1. Reduction of number of men in the barrack-rooms to the extent recommended.

2. Ventilation of the stables by shafts and inlets for air.

3. Ventilation of the corridors to be improved by additional lighting shafts, carried from the ceiling to the existing skylights, and by providing permanent ventilation under all the skylights. Ventilation of every barrack-room by a shaft and inlet for air, as described above.

4. Ventilation of the guard-room and school-room in a similar manner.

5. Ventilation of all the workshops and library by a large Arnott's silk flap ventilator into the chimney, and by ventilating panes in the windows.

6. Reconstruction of all the privies, and their conversion into water latrines, with divisions, half-doors, &c., as recommended. Also the urinals to be supplied with water for cleansing.

7. Kitchens to be supplied with roasting ovens, and to have additional windows, with louvred panes, for light and ventilation.

8. Women's wash-house to be supplied with drying stove, and to be better lighted.

9. Lavatory to be supplied with foot gratings, pegs, and forms. Bath accommodation to be increased to the extent of one bath for every 100 men.

10. Ash-pits to be replaced by iron carts, and stable manure to be more frequently removed.

11. Paving of the long back yards behind the stables to be relaid with square sets, and suitable gutters for surface drainage.

12. Introduction of the town water to all parts of the barrack.

13. A day-room for the men ought to be provided.

*Cavalry Hospital, Hulme.*

The cavalry hospital is situated at one corner of the barrack yard, in rather a close situation, and without a free circulation of air round it.

It contains seven wards and 40 beds. Four of the wards have windows on both sides, and three have windows on one side.

The space per bed is about 1,100 cubic feet on an average, and is so near the amount required by our instructions that we do not consider it needful to make any reduction in the number of beds, until at least certain improvements in the ventilation, which we shall presently suggest, are tried.

The wards have no ventilation except what may be casually obtained from doors, windows, and fireplaces, and we do not consider this to be enough when the deficient height of the wards, which is only 11 feet, is considered.

We would propose to remedy this defect by carrying from the ceiling of each ward to the roof a ventilating shaft, protected by louvres, and by introducing fresh air by inlets near the ceiling.

The wards communicate by means of a corridor, which ought to be independently ventilated by a shaft at each end carried to the roof of the hospital, and by an inlet for air so arranged that during cold weather the air would be made to pass over a fire-brick surface, heated by a stove, before entering the corridor. By this plan the whole mass of air in the hospital might be preserved in a state of warmth during winter. There should be a communication opened between the wards and the corridor to enable the fresh warm air to enter and diffuse itself through the former.

Each ward is warmed by a large grate, but the fire place and chimney are so wide and open that most of the heat escapes up the chimney, and the smoke enters the wards.

There are no water-closets in the hospital. There is a privy for the patients, with flushing arrangements, in the yard behind the hospital. It can only be reached by the sick leaving the building and walking across the back yard in all states of the weather. Proper water-closets are required.

There is a privy belonging to the itch ward, which has no ventilation except into a species of closed vestibule opening into the itch ward.

The hospital ash-pit is situated under the same roof as this privy and ward, and has its ventilation also in common with them.

The ash-pit must be abolished and the refuse removed daily.

The privy ought to be converted into a water-closet, and properly lighted and ventilated through the roof.

The surface of the back yard is imperfectly drained, and water is apt to lie on it after rain.

Water for the hospital is procured from a well. It is said to be good; but the building should certainly be supplied from the city water mains along with the rest of the barracks.

There is a bath-room, but the bath accommodation requires to be improved by providing fixed baths with hot and cold water laid on.

There is no lavatory accommodation, a defect which should also be supplied.

The wards are lighted by tallow candles, as is also the surgery.

There is gas in the hospital, and it ought to be led into the wards and surgery, where it would be a great boon.

There is no provision or bedding store, and no coal shed. The windows of the pack store require gratings for protection.

There is no accommodation for the sick of soldiers' families.

The kitchen is dark and is not sufficiently ventilated.

The urinals require water being laid on.

*The Sanitary Improvements immediately required for this Hospital are:—*

1. Ventilating all the wards and corridors by shafts and inlets as described, and by supplying warm air during winter through stoves in the passages.
2. Remodelling the fire-places in the wards to warm a portion of the air admitted.
3. Improved drainage of the back yard.
4. Removal of ash-pit, and conversion of the privy of the itch ward into a water-closet, with light and ventilation.
5. Water-closets, urinals, and lavatories to be constructed for each flat of the hospital, and a fixed hot and cold bath to be supplied to the bath-room.
6. Kitchen to be lighted by additional window space, and ventilated by louvres in the roof.
7. Present urinals to be supplied with water.
8. Stores to be improved or supplied where wanting.

Lastly. It would be very desirable to provide a room in some convenient position, not in the hospital (where there is no accommodation), for receiving the sick of soldiers' families.

## 2. SALFORD INFANTRY BARRACKS.

These barracks are situated on the outskirts of the borough of Salford, in a comparatively open situation.

They are built in blocks, called the right and left wings, and arranged in a square, having soldiers' barracks on two opposite sides; officers' quarters and the hospital on a third side; opposite which, on the fourth side, are the barrack offices and a large school-room.

The latrines, lavatories, wash-houses, kitchens, &c. are arranged behind the barrack buildings, and close to the boundary walls.

The total area occupied by the barracks is 8 acres, 3 roods, 27 perches.

The present buildings were erected in 1820–21. They are of brick, standing in a gravelly subsoil.

The barrack is drained into the town sewers, and the town water was about to be introduced at the time of our inspection, in lieu of well water, with which the barrack has been previously supplied.

The arrangement of the barrack-rooms differs in different blocks. In all, the rooms go from back to front of the block, but in one wing the staircase giving access to the upper rooms, as well as the passages, are taken out of the rooms by wooden partitions, an arrangement which deprives the rooms of windows, and makes their internal structure more complicated than it ought to be.

In these rooms also a non-commissioned officers' bunk is placed in one corner of the barrack-room, and partially obstructs the light of another window.

In the other blocks the rooms are reached by passages and staircases, extending from back to front of the buildings, with a non-commissioned officers' room on the landing. This is a much better arrangement than the other, because the ventilation is better and the light more abundant.

The whole barrack is intended to hold 938 non-commissioned officers and men. The men's rooms are somewhat overcrowded, as the following table will show:—

| Rooms. | Total Regulation Number of Men. | Total Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 41 | 574 | 492 | 82 | 14 | 12 |
| 11 | 176 | 132 | 44 | 16 | 12 |
| 9 | 135 | 126 | 9 | 15 | 14 |
| 61 | 885 | 750 | 135 | — | — |

The average cubic space we have given per man for accommodating 750 men in the soldiers' rooms is somewhat under 600 cubic feet per man, but even at that rate there are 135 more men in this barrack than the rooms ought to hold.

It will be necessary, therefore, to remove two men out of each room in the first set in the table; to remove four men out of each room in the second set; and one man out of every room in the third set.

None of the rooms are thoroughly ventilated, although they have openings in the ceilings, and it will be necessary to provide a shaft from the corner of each room, carried above the roof, having a sectional area of 12 square inches per man for the rooms on the upper floor, and 11 square inches per man for the rooms on the lower floor, for carrying off foul air, and to provide inlets for fresh air, protected by perforated zinc near the ceiling.

The lavatories are good and have baths and foot-pans. It would be advisable to double the number of baths so as to provide one for every 100 men.

The lavatories require pegs and gratings.

The latrines are very offensive; they are drained and have water for flushing; but they ought to be converted into water latrines with half-doors and divisions, and suitably ventilated and lighted.

The urinals require water to be laid on.

The kitchens have no means of cooking except boiling. They require roasting ovens. They also require ventilation.

There is a wash-house with four boilers and sixteen tubs, but there is no drying stove. Properly speaking there is no laundry.

There is neither day-room nor covered shed for drill.

The water supply was derived at the time of our inspection from wells and rain-water tanks, but, as already stated, the town water was about to be introduced.

There are two school-rooms, one is a large, excellent room, but it requires ventilation by tubes in the roof.

The whole barrack is lit by candles, in lieu of which gas, with ventilated burners, ought to be introduced.

All the drains are stated to be properly trapped, and they do not pass under the buildings.

The guard-room is imperfectly ventilated, and requires improvement in this particular.

There are large and offensive ash-pits belonging to these barracks, which ought to be done away with, and the refuse collected and removed in iron carts.

*The following are the Sanitary Improvements required for this Barrack :—*

1. Reduction of number of men to the extent indicated.
2. Ventilation of every barrack-room by a shaft and inlets for air, and also of the school-room, guard-room, and cook-houses.
3. Increase of bathing accommodation, and pegs and gratings to be provided for the lavatory.
4. Latrines to be reconstructed, with proper water receptacles ; water to be laid on for flushing, also divisions and half-doors to be provided, and additional ventilation and lighting to be introduced. Urinals to be provided with water.
5. Kitchens to be provided with roasting ovens.
6. Wash-house to be provided with drying stove.
7. Ash-pits to be done away with, and refuse to be collected and removed daily in iron carts.

Lastly. Married quarters are much wanted in this barrack, and it would be a great improvement to light the whole of it with gas. Day-rooms and drill sheds are also required.

*Salford Barrack Hospital.*

This hospital is situated at one corner of the barrack square. It is built in the form of the letter E, the wards forming the projections at each end of the centre. The wards are connected by a passage at the back of the building, out of which the surgery and store room open. The kitchen and offices are in the back yard, and are connected with the main building by a covered passage.

The hospital contains 12 wards and 93 beds.

The following is the accommodation as contrasted with what it would be at 1,200 cubic feet per bed :—

| Wards. | Total Beds. | Total Beds at 1,200 Cubic Feet each. | Deficiency of Bed Space. |
|---|---|---|---|
| 1 | 10 | 5 | 5 |
| 2 | 12 | 8 | 4 |
| 3 | 12 | 8 | 4 |
| 4 | 10 | 5 | 5 |
| 5 | 10 | 6 | 4 |
| 6 | 12 | 8 | 4 |
| 7 | 12 | 8 | 4 |
| 8 | 10 | 6 | 4 |
| Small Wards. | | | |
| 1 | 1 | 1 | — |
| 2 | 1 | 1 | — |
| 3 | 1 | 1 | — |
| 4 | 2 | 2 | — |
| 12 | 93 | 59 | 34 |

In order to set aside 1,200 cubic feet for each patient, it will be necessary to remove 34 beds out of the wards, which will give as nearly as may be, 1,200 cubic feet for each of the remaining 59 beds.

There are ventilating apertures in the ceiling of each ward, but it would be advisable to insert proper shafts, carrying them up to the roof of the building.

The window sashes open on pivots, an arrangement which is objected to. They should be made to draw down at top, in the usual way.

There are no water-closets belonging to the hospital. There is a privy in the yard behind, which the sick must reach by walking exposed in the open air.

The privy in the yard is very offensive, and requires to be reconstructed as a water latrine.

Water-closets are required for each flat. We believe this improvement has been already decided on.

There is no bath-room. One is much needed, having proper baths and hot and cold water laid on. A lavatory is also much wanted. At present the sick must wash either in the wards or in the open air.

The kitchen is in the back yard, behind the hospital. It is very imperfect, and requires a proper cooking range.

There is an ash-pit in the back yard which ought to be removed, and the kitchen refuse collected and taken away daily, with the other refuse of the barrack.

Water is at present derived from a well, but as the town water is about to be introduced, this defect will be remedied.

The fire-grates in this hospital, like those in most other hospitals, are not of a good construction, and waste a great deal of heat. Better grates are required.

There is gas in the hospital, but none in the wards. This defect should be remedied.

There is no room for orderlies.

There is no accommodation for the sick wives and children of soldiers.

*The following are the Sanitary Improvements required for the Hospital :—*

1. Reduction of beds, as stated.
2. Ventilation of every ward by a shaft from the ceiling carried up to the roof, and by a perforated glass pane in each window.
3. Water-closets, lavatory, and bath-room, with hot and cold water laid on, to be provided within the hospital. Water latrines to be constructed in lieu of the privy.
4. A new kitchen cooking range (one of Howell's, or Burridge and Headle's) should be provided.
5. The ward grates might be advantageously remodelled, so as to admit warmed air into the wards in winter.
6. Gas to be introduced into the wards.
7. Ash-pit to be removed.

Lastly, it would be very advisable to provide a room for sick women and children.

## 3. BURNLEY BARRACKS.

These barracks are situated in an open, healthy locality, on the summit of a hill, about a mile and a half from the town of Burnley. The surrounding ground is almost entirely free from houses.

The barracks are constructed to accommodate 118 cavalry, and 136 infantry, non-commissioned officers and men.

The buildings occupy three sides of a square, 5 acres and 9 perches in area, the canteen hospital, and a fives'-court filling up the fourth.

The officers' quarters occupy one end of the square.

Between the buildings is an extensive parade ground, which would be very much improved by additional drainage, gravelling and rolling.

The water supply is derived partly from the Burnley water-works, partly from pumps, and partly from rain water tanks. The buildings are partly drained by pipe drains, carried to an outlet near the barrack gate ; but part of the drainage is received into cesspits, one of which is close to the hospital wall. It is intended to economize foul water for flushing the hospital privy. The arrangement is so very bad an one, that we beg to recommend its prohibition. All cesspits ought to be filled up, the drainage properly disposed of, and the water supply from the town waterworks increased to the amount required for all purposes.

*Cavalry Barracks.*

The rooms in the cavalry barracks are built over the stables.

The stables are narrow, and defectively ventilated.

The ventilation requires to be improved by shafts, carried up at each side from the ceiling of the stable to above the roof of the barrack, and by perforated panes of glass in the windows to admit fresh air. Additional light should also be admitted to the stables.

The barrack-rooms open on either side out of a central passage, which is dark and imperfectly venti-

lated. A ventilating skylight, between the centre of this passage and each end, should be provided in the roof, opening through the ceiling of the passage. These skylights would afford the necessary light and ventilation.

The barrack-rooms are partially ventilated by means of hollow beams, but the smell of the stables in them was most offensive.

These rooms require shafts and inlets for additional ventilation.

The following is the amount of accommodation in the cavalry barracks :—

| Troop Rooms. | Total Number of Men according to existing Regulations. | Total Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Mn. |
|---|---|---|---|
| 12 | 108 | 72 | 36 |

The accommodation is, therefore, deficient 30 per cent., and the total number the barrack will hold is seventy-two men. Each room is capable of containing six men instead of nine, its present complement.

The ablution-room has no bath, and no gratings nor pegs ; one bath should be supplied. The ablution-room is too small for both purposes, but it might be enlarged by adding to it the saddler's shop, which is unsuited to its purpose, and building a new saddler's shop.

The present saddler's shop is very dark, and having no fire-place it cannot be used in winter.

The cook-house is in a building projecting from the barracks, and is entered from the passage, in which is the staircase giving access to the barrack-rooms. Above it is a serjeant's room. There is no oven in the cook-house, and the boilers require reconstruction.

A cooking range, with an oven, would be applicable to this kitchen.

The privies are in a bad condition. They are not flushed daily, and water does not stand in them. They should be reconstructed, and converted into water latrines, with proper flushing arrangements. Seats with divisions, half-doors, and additional means of lighting are also required.

The urinals should be supplied with water.

The manure heap at the back of the cavalry barracks was full, and very offensive at the time of our inspection.

The ash-pit was also objectionable.

For both of these an iron cart, for daily collection and removal of the refuse, should be substituted.

The daily collection and removal of manure and refuse is the more necessary in this instance, as the offices connected with these barracks, and also the manure heaps and ash-pits, are situated against the boundary wall, close to the stables and barrack-rooms, from which they are separated by a narrow, badly paved, and ill-drained yard, in a very filthy state.

This passage ought to be well paved with square setts, and properly drained. If this were done, it would be possible to keep the surface clean.

These narrow back yards are common to almost all cavalry barracks, and, from the very objectionable plan of lodging the men over the horses, it is usual to see manure heaps, privies, ash-pits, urinals, &c., congregated together as in the present case, close under the barrack-room windows, and perhaps the kitchen, as in these barracks, in the middle of them. Were there space enough, conveniently situated, we should feel disposed to advise the whole of these offices to be removed and reconstructed at a safe distance from the barracks.

*The following are the Sanitary Improvements we would recommend :—*

1. Reduction of numbers of men in each room to the extent stated.

2. Ventilation of the stables by air shafts and perforated glass panes ; ventilation of the sleeping rooms by shafts and inlets ; ventilation and lighting of the passage by skylights.

3. Reconstruction of privies, and substitution of water latrines with flushing arrangements, divisions of seats, half-doors, and additional light. Urinals to be supplied with water.

4. Roasting oven to be provided for the kitchen, and boilers to be reconstructed.

5. Ablution-rooms to be enlarged, and supplied with pegs and gratings, and with a bath and foot pans.

6. Back yard to be repaved with square sets and guttered.

7. Ash-pit to be removed. Iron carts and daily removal of all manure and other refuse to be substituted.

8. New saddlers' shop to be provided.

*Infantry Barracks.*

The infantry barracks are constructed to accommodate 136 men ; they are two stories high. The barrack-rooms open out of a passage and staircase, which are placed between every two rooms on each floor. The rooms are overcrowded, and the means of ventilation are defective. The following is the accommodation :—

| Soldiers' Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 11 | 132 | 77 | 55 |

Each room has regulation accommodation for 12 men, with about 350 cubic feet per man, while there is accommodation for no more than seven men at 600 cubic feet per man. It will be necessary, therefore, to remove the excess of men out of these rooms.

To improve the ventilation, each room requires an air shaft and inlets for air. Remodelled grates, for warming the air in winter, would be an advantage.

The urinals have no water.

The privies require reconstruction on the principle recommended above for the cavalry barracks.

The cook-house requires a shaft up through the roof for ventilation, and inlets for air by perforated panes or otherwise. It has no means of cooking except by boiling.

The ash-pit is objectionable. It should be done away with, and removal of the refuse by an iron cart substituted.

The ablution-room has no gratings nor pegs.

There are no baths.

The guard-room and the lock-up room want ventilation ; shafts could be carried up by the side of the chimney, and inlets for air should be provided.

The cells are not good, but they are ventilated, and the passage is warmed by a stove.

The women's wash-house requires a grating for the feet, and it has no drying stove.

These barracks contain accommodation for four married non-commissioned officers, but there is no accommodation for married soldiers.

The exterior of the whole barrack is lit with gas, but all the rooms, both on the cavalry and infantry side, are lit with candles. It would be a great advantage to introduce gaslight throughout.

*The following are the Sanitary Improvements required :—*

1. Reduction of number in every barrack-room as stated.

2. Ventilation of every barrack-room, of the guard-room, and lock-up, and of the kitchen by shafts and inlets for air. Grates to be reconstructed to warm the admitted air.

3. A roasting oven for the kitchen.

4. A bath, foot-pans, gratings, and pegs to be provided for ablution house.

5. Reconstruction of privies into water latrines with flushing arrangements, divisions of seats, half-doors, and improved light and ventilation. Urinals to be supplied with water.

6. Removal of ash-pit. Refuse to be collected and removed by iron cart.

7. Drying stove and foot grating for women's wash-house.

Lastly. Both cavalry and infantry barracks should be lit with gas, and day-rooms and covered drill sheds provided.

*Burnley Hospital.*

The hospital is a small ill-constructed building; hardly suitable for treating serious cases of disease.

The wards are low and overcrowded, and their ventilation is defective. They are so small that the ventilation might be sufficiently improved by introducing a large Arnott's silk flap ventilator into the chimney, along with perforated panes in the windows. The grates might be remodelled with advantage, so as to admit warm air to the wards during winter.

The kitchen requires an oven.

There is no fixed bath.

There is no water-closet.

The privy wants ventilation at the top. A large cesspit, which receives the refuse water from the women's wash-house for purposes of flushing, should be done away with, and sufficient water for flushing provided.

*The following are the Sanitary Improvements we would recommend:—*

1. Reduction of beds, so as to give as nearly as may be 1,200 cubic feet for each bed.

2. Ventilation of wards as described.

3. Construction of a suitable water-closet, improvement of existing privy, and abolition of the cesspit.

4. An oven for the kitchen.

5. A fixed bath, with hot and cold water laid on.

## 4. BURY BARRACKS.

These barracks occupy an airy, healthy position, at a short distance from the town of Bury.

They contain accommodation for cavalry and infantry, and the buildings are so arranged as to leave a spacious square in the centre, suitable for a parade ground.

The area enclosed within the boundary wall is seven acres. The subsoil consists partly of clay, and partly of gravel and made ground, and there are no local sources of malaria in the neighbourhood.

All the buildings are of stone and were erected in 1845.

This barrack appears to us to be a favourable specimen of healthy barrack construction, although there are some points in which improvements might be made.

The cavalry barracks occupy one block of building, extending nearly the whole length of one side of the square. The infantry barracks occupy the corresponding block on the opposite side. The remaining two sides are formed by the officers' quarters and hospital, and by the prison, guard-room, barrack offices, &c.

Behind each block of barrack-rooms is a broad, well paved court, with an excellent range of one-story buildings, containing the cook-houses, lavatories, stores, &c., behind which, and close to the boundary walls, are the latrines, ash-pits, and urinals.

An arrangement such as this, by which the latrines and urinals are removed to a sufficient, but not to too great a distance from the barracks, and concealed by an intervening range of outhouses, is one worthy of imitation.

The cavalry barracks have the soldiers' rooms over the stables, which is an arrangement always to be avoided if possible, but at the same time the evils resulting from it have been materially diminished in the present case by ventilating each stable by a shaft carried up in the chimney stalk, and by the manner in which the rooms above have been arranged.

The usual means of access in cavalry barracks is by a long dark corridor, as at the Hulme barracks, described above, running from end to end of the range, with the barrack-rooms opening right and left out of it. This arrangement is prejudicial alike to the health and comfort of the men.

In the Bury barracks, on the contrary, access to the rooms is obtained by wide, roomy, well-lighted and ventilated stone staircases, occupying the whole breadth of the building, with ventilation by open door-ways right across the building, and dividing it, in fact, into a number of separate blocks under one roof.

The infantry barracks are constructed on a similar plan, except that the lower rooms are used as barrack-rooms.

Both Cavalry and Infantry Barracks have no more than two floors, another excellent feature in the construction.

The whole barrack contains regulation accommodation for 338 non-commissioned officers and men; and there are in all 20 barrack-rooms with the accommodation shown in the following table: —

| Rooms. | Total Regulation Number of Men. | Total Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 8 | 128 | 104 | 24 | 16 | 13 |
| 4 | 64 | 64 | — | 16 | 16 |
| 8 | 120 | 96 | 24 | 15 | 12 |
| 20 | 312 | 264 | 48 | — | — |

Each of the first series of eight rooms contains three men more than it ought. The same is the case with the last eight rooms. There are four rooms which contain the proper number of men.

There are several unoccupied rooms, into which part of the excess of men might be drafted, which would reduce the number otherwise to be provided for.

All the barrack-rooms have four good sized windows, two at each end, but in each of the lower rooms, on the infantry side, a compartment is partitioned off in one corner for a non-commissioned officer, an arrangement which ought to be avoided, as it interferes with the light of one window, encumbers the room, and tends to obstruct its ventilation. If the non-commissioned officer is married, his wife uses the barrack-room fireplace for cooking and heating irons.

In the upper flat this is avoided, by having the non-commissioned officers' room at the end of the staircase.

Each barrack-room has a porch of wood within it. There are no shelves, and the top of the porch is used instead.

It would be advantageous to put up shelves between the windows at each end of the room.

There are no means of ventilation, except by doors and windows. We would recommend the introduction of a ventilating shaft with inlets, as already described, into each room, and also reconstruction of the grates to admit warm air during winter.

The barrack-rooms are lit by candles. Gas ought to be introduced instead.

There are no day-rooms for the men, nor covered sheds for drill.

There are two good detached lavatories, one on each side of the barrack. They are provided with benches, basins, foot-pans, and bath accommodation.

These arrangements are excellent, so far as they go, but it would be advisable to provide an additional bath on the infantry side, and both the ablution-rooms should have gratings for the men to stand on, and pegs for their coats.

There is no laundry. There is a women's wash-house, but it has no means of drying or getting up linen. A drying stove is required.

There are no married quarters. There are two cook-houses, one has eight boilers and the other three. There are no means for roasting or baking meat. A suitable roasting oven should be put up in each kitchen.

The water supply is derived from four rain-water tanks, and from seven pump wells. Certain of these wells are close to the privy cesspits, and become occasionally impure, apparently from soakage. The quantity of water is not sufficient for present use, and an additional supply will be required for the improved drainage we are about to recommend.

The town of Bury has extensive waterworks, and its mains come up to the toll bar at a short dtstance from the barracks. The town water is in fact laid on for the building operations at the new militia stores, close to the barracks.

Whenever water can be obtained from mains it ought to be laid on to all barracks, and we would recommend this being done in this instance also.

The great defect in these barracks is their want of sewerage. In fact they have none, except surface drainage, and the latrines are, consequently, in a condition which affords a very unfavourable contrast with the other arrangements of the buildings.

The latrines are placed against the walls behind the barrack offices, and are very well placed so far as the plan is concerned, but they are very offensive, and require reconstruction. Immediately outside the wall are immense cesspits, into which all the drainage passes, and accumulates till it is pumped out and carted away.

There are no town sewers close to the barracks into which the drainage could be carried. The same defect exists at the adjoining militia buildings ; but we understand it is intended to carry the drainage from these buildings to the river, through the adjoining fields. A similar course might be taken in draining the barrack without danger. The barrack drainage might be connected with the militia store drainage. The river, which is the natural outlet, at present receives a large amount of drainage from town population as well as from factories, and the small additional quantity from an establishment with 338 men would increase its present impurity to a very small extent indeed.

So far as the mere practical question of getting rid of the drainage is concerned, it might very well be done in this way. At the same time, we are of opinion that in all public proceedings of this kind it is well to avoid objections if possible. It has been justly objected that water streams have been unnecessarily polluted by draining houses into them. Nevertheless, the houses must be drained. It is not for a moment to be admitted that the ground on which a house stands is to be saturated with cesspool matter, whatever becomes of the drainage. The first thing is certainly to get it removed away from the house. But there is no necessity to pollute water streams with it. Sewage manure is very valuable in fertilizing grass land ; and it would be advisable, with regard to detached barracks, generally, to inquire whether the sewage could not be removed to a sufficient distance to leeward of the buildings, and there applied for irrigation ; or, if suitable land cannot be obtained, whether a tank might not be constructed for receiving and deodorizing the drainage at a distance from the barracks, the deodorized overflow from which might be allowed to pass into any stream with safety. The question is one of importance, as cases have come under our notice in which there appears to be no other way of disposing of the sewage. In either case a proper tank would have to be constructed, into which the periodical flushings from the barracks could be conveyed by pipe drains.

There are two such reservoirs or cesspits immediately outside the barrack walls at Bury. They are of considerable dimensions, and contained a large quantity of fluid at the time we saw them. In our opinion both of these tanks ought to be removed to a greater distance, and some means provided for disposing of the fluid part. The latrines urgently require improvement, and unless the drainage be improved, as suggested, it will be impossible to make the needful alterations in them.

They require to be supplied with proper soil-tanks, in which water will always remain at a certain level, and which can be flushed out once or twice a-day into the sewers. They should be supplied with divisions and half-doors. They should be ventilated at the roof, and lighted from above in the ratio of not less than one and a half square foot of glass for each seat.

It is stated that the urine is taken away for dyeing by the manufacturers of the neighbourhood. We see no objection to this, if suitable iron tanks be provided outside the barrack walls, into which it can be received along with the contents of the urine tubs.

The ash-pits are uncovered, and are open to the usual objections. It would be very desirable to substitute iron carts for them, and to remove the refuse daily.

The manure pits behind the cavalry stables are too deep and require drainage.

The guard-room has no separate place for prisoners. It has no sufficient ventilation.

There are two orderly rooms adjoining each other. It has been suggested that it would be an improvement to have a door through the wall, to enable them both to be used by the commanding officer when there is only one regiment in barracks.

The officers' quarters require sanitary improvements in their drainage, similar to those recommended for the barracks. The ash-pit belonging to them should also be removed, and an iron cart substituted for daily collection of the refuse.

*The following are the Sanitary Improvements required for the Barracks:—*

1. Reduction of numbers in the barrack-rooms to the extent stated above.

2. Every barrack-room, and the guard-room, to be ventilated by shafts and inlets for air.

3. Lavatories to have gratings for the feet, and pegs to hang coats on, and an additional bath to be placed in the lavatory on the infantry side.

4. Women's wash-houses to have drying stoves provided.

5. Cook-houses to be supplied with roasting ovens.

6. A better water supply to be provided, by bringing in the town water.

7. Reconstruction of privies by converting them into water latrines, and removing the drainage to a distance in one of the modes suggested. Also supplying the latrines with divisions and half-doors, light, and ventilation.

8. Iron carts to be substituted for the ash-pits, and manure depôts to be improved as suggested.

9. It would be a great improvement if gas were introduced, and a ventilated gas-burner placed in every barrack-room.

Lastly, day-rooms and covered drill sheds should be provided, and married quarters built for the regulation number of married soldiers' families.

*Hospital, Bury.*

The hospital stands on one side of the barrack parade ground in a line with the officers' quarters.

It has four wards and 30 beds, with the defi-

ciency of accommodation shown in the following table :—

| Rooms. | Present Number of Beds. | Number at 1,200 Cubic Feet per Bed. | Deficiency in Bed Space. |
|---|---|---|---|
| 1 | 6 | 4 | 2 |
| 2 | 9 | 6 | 3 |
| 3 | 9 | 6 | 3 |
| 4 | 6 | 4 | 2 |
| 4 | 30 | 20 | 10 |

The accommodation at 1,200 cubic feet per bed is only sufficient for twenty beds.

None of the wards are ventilated; they require shafts to be carried up from the ceilings to the roof, and inlets for air near the ceiling properly protected by perforated zinc. To enable sufficient ventilation to be kept up during winter, we would recommend the grates to be reconstructed, with fire-brick compartments behind each grate, through which the air could be admitted warm into the wards.

There is no water-closet in the hospital. The only accommodation of this kind for the sick is an offensive privy in the back yard, which is drained into one of the large cesspools already described.

Proper water-closets are required, and should be built out from the first floor of the hospital.

Another of these privies adjoins the itch ward, and the effluvia from it was strongly perceptible in the ward. This privy should be converted into a water-closet, and the privies in the back yard into a water latrine.

There is no lavatory for the sick. In summer they wash in a shed in the back yard, and in winter they wash in the bath-room, which is dark, and not provided with suitable conveniences.

This bath-room is situated on the ground floor, and has no light except what it derives from a corridor which occupies part of the front of the building.

There is no fixed bath in the bath-room, and no copper for heating water. There is only a slipper bath in it.

This room might be made sufficient for both bath-room and lavatory by being properly fitted up with slate benches, basins, a fixed bath having hot and cold water laid on, and with a shower bath.

The only water supply to the hospital is from a rain-water tank in the back yard, or from the nearest barrack pump.

It should be supplied by the town water.

The kitchen is under one of the wards, and should be ventilated by a shaft carried up to the roof. It requires a bracket for roasting, and the boiler in the scullery is stated to be out of order.

The passages are lit with gas, but there is none in the wards. This defect requires remedy.

There is no hospital accommodation for the sick of soldiers' families.

*The following are the Sanitary Improvements required for this Hospital :—*

1. Reduction of number of beds, and allotting 1,200 cubic feet to each.
2. Ventilation of the wards by shafts and inlets, and reconstruction of grates, as described. Ventilating shaft for the kitchen.
3. Water-closets to be built out, with access from the first floor of the hospital. Privy of the itch ward to be converted into a water-closet, and the privies in the yard to be converted into a water latrine.
4. Bath-room to be improved, and lavatory accommodation provided, as described.
5. Water supply to be provided.
6. Roasting bracket to be put up in the kitchen, and the scullery boiler to be repaired.
7. Wards to be lit with gas by ventilated burners.
8. A room to be set apart for the sick of soldiers' families.

## 5. STOCKPORT BARRACK.

This is a small barrack, intended for the accommodation of 172 non-commissioned officers and men. It was unoccupied at the time of our inspection. It consists of a single block of buildings, part of which is intended for officers' quarters. It stands in about an acre and a quarter of ground, on a loamy and gravelly subsoil, and in an elevated and healthy position, in the suburbs of Stockport.

Besides the barrack-rooms, the square contains the hospital, tennis court, magazine, cells, guard and orderly room, canteen, and the usual offices.

The building contains in all 10 barrack-rooms, of different dimensions, with regulation accommodation for 160 men.

The following table shows the manner in which the accommodation is allotted, as contrasted with what it ought to be if 600 cubic feet of space were set apart for each inmate :—

| Rooms. | Total Regulation Number of Men. | Total Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 4 | 64 | 48 | 16 | 16 | 12 |
| 6 | 96 | 66 | 30 | 16 | 11 |
| 10 | 160 | 114 | 46 | — | — |

The rooms may be classed as of two sizes, four of which are larger than the others. In order to give 600 cubic feet per man, as nearly as may be, it will be necessary to remove four men out of each by reducing the numbers from 16 to 12 men per room. The remaining six rooms being of smaller dimensions, although containing the same regulation number of men, will require to have the number of inmates in each reduced from 16 to 11 men.

The total deficit of accommodation is, therefore, for 46 men out of 160, leaving 114 men as the number which these barrack-rooms ought to contain.

Each room is lighted by a window at either end. The stairs are of wood, and are partitioned off from the rooms, an arrangement which is open to objection, because it interferes both with the light and ventilation of the barrack-rooms.

The rooms have ventilators in the ceilings, but they are not sufficient for health. We would propose to improve the ventilation by carrying up a foul-air shaft from the ceiling of each room above the roof of the barrack, and by providing inlets for air to be diffused through perforated zinc, near the ceiling.

The grates in these rooms are of the usual construction, and waste a large part of the heat. We have under consideration plans for improving all existing barrack grates, for economising heat and facilitating ventilation; and when our inquiry is completed, we propose to apply the results practically in all barrack-rooms and hospitals.

The water supply of the barrack is derived from pumps, although the Stockport Water Company's mains are said to pass close to the boundary.

This water ought to be introduced into the barracks, for it is only by doing so that the necessary drainage can be effectually carried out. Besides, the repairs of pumps, tanks, &c., form a large annual item in the cost of barracks, which would be mostly avoided by a better water supply.

The ablution-rooms require ventilation. They have neither gratings nor pegs to hang coats on.

There are no baths.

The cook-house is fitted up with six iron boilers, which might be advantageously reconstructed. There are no other means of cooking. A properly ventilated roasting oven is required.

The ventilation of the cook-house would be much improved by the introduction of perforated glass panes into the windows.

The privies are imperfectly constructed, and are offensive. We have been informed that the drain from them is carried to a distance, and the sewage is spread over land as manure. This should always be done where land at a suitable distance from inhabited buildings can be obtained. The privies should be reconstructed as water latrines, with suitable flushing arrangements.

The urinals require water to be laid on.

The women's wash-house requires a drying stove.

There is no foul bedding or straw store; and the straw for the beds being put into the loft of the officers' stables, is apt to be used for litter.

This barrack is lit by candles.

There is no day-room for the men.

There is no school-room. A barrack-room is appropriated as a school-room and library.

There are no store rooms.

There are no quarters for married non-commissioned officers or privates.

There are neither cleaning-rooms nor covered shed for drill. There is, however, a good tennis court.

The guard-room requires ventilation by a shaft and inlets for air.

*The Sanitary Improvements we consider necessary are as follow:—*

1. Ventilation of every barrack-room, and of the guard-room, by shafts and inlets, as described.
2. Reduction of numbers in each barrack-room, to give 600 cubic feet per man.
3. Ablution-room to be ventilated, and pegs and gratings to be provided. A bath, supplied with water, to be provided.
4. Cook-house to be ventilated by glass louvres in the windows. Boilers to be improved, and a roasting oven to be provided.
5. Privies to be reconstructed, and converted into water latrines, with means of flushing.
6. Urinals to be supplied with water.
7. A drying stove to be provided for the women's wash-house.

The other requirements, namely, a day-room, covered drill shed, school-room, cleaning-room, library, and married quarters, should also be attended to, and the barrack should be lit with gas.

*Stockport Barrack Hospital.*

This is a small, badly-constructed, and inconvenient hospital, situated at one corner of the barrack square, and only suited for cases of slight and very temporary illness. It consists of four wards, three of which are like small cottage rooms, and the fourth is larger. The accommodation is for 28 patients, but at 1,200 cubic feet per bed the wards would not, by any means, hold that number, as the following table will prove:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| 1 | 11 | 5 | 6 |
| 2 | 11 | 4 | 7 |
| 3 | 3 | 1 | 2 |
| 4 | 3 | 2 | 1 |
| 4 | 28 | 12 | 16 |

The whole building contains accommodation for 12 beds instead of 28. The excess of beds, 16 in number, should therefore be removed.

Ventilation is provided for by openings in the ceiling, but they are very inefficient for the purpose. Shafts and inlets for air are required.

There is no lavatory. The men wash in the wards. The bath arrangements are defective.

There is no water-closet within the building, but there is an offensive latrine, without any water supply, in the yard outside, and partly under the hospital.

There is an ash-pit in the yard outside, too close to the wards.

The hospital staircase is tortuous and inconvenient, and the passages not properly lighted nor ventilated.

The kitchen is under one of the wards, and has no provision store. It should certainly be removed out of the building altogether.

There is no shelter for convalescents, and no accommodation for them within the building on account of its defective structure. There is no water-tap in the surgery.

It would not be advisable to incur much cost in improving this building, on account of its general unfitness for a hospital. There are, however, certain improvements which are indispensable, if sick are to be received into it even temporarily.

*These Improvements are as follow:—*

1. Reduction of numbers, and setting apart 1,200 cubic feet for each bed.
2. Ventilating wards by shafts and inlets for air.
3. Increasing the light and ventilation of the staircase, by opening an additional window at the end.
4. Providing a water-closet and bath within the hospital.
5. Converting the privies in the yard, under the hospital, into a water latrine.
6. Removing ash-pits, and providing for daily collection and removal of refuse.
7. Removing the kitchen from within the hospital, and providing another kitchen.
8. A water tap and sink are required in the surgery.

## 6. ASHTON BARRACKS.

These barracks are placed on an airy, healthy situation, about a mile and a half from Ashton. They are isolated from buildings, and occupy an area of seven acres, partly of clay, partly of made ground. They are of stone, and were built in 1845.

The general arrangement and construction on both cavalry and infantry sides are the same as those of the barracks at Bury. They have the same advantages, and their defects are similar.

They are constructed for 328 non-commissioned officers and men. The following table shows the barrack-room accommodation, as contrasted with what it would be at 600 cubic feet per man:—

| Rooms. | Present Regulation Number of Men. | Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 8 | 128 | 104 | 24 | 16 | 13 |
| 3 | 48 | 48 | — | 16 | 16 |
| 8 | 120 | 96 | 24 | 15 | 12 |
| 1 | 6 | 5 | 1 | 6 | 5 |
| 20 | 302 | 253 | 49 | — | — |

There is thus in the infantry barracks a deficiency of accommodation for 49 men on the present construction. In the three cavalry rooms the space is upwards of 600 cubic feet per man.

All the barrack-rooms and the guard-room require ventilation by shafts carried up from the ceilings, and by inlets for air.

This barrack has a water supply derived from Ashton Waterworks. It was brought in on account of the well water being unwholesome, but from the smallness of the water pipe within the barrack yard, the quantity of water delivered is insufficient. This is a defect which ought to be remedied forthwith.

There is no drainage, except surface drainage, which is led into a watercourse close to the barrack. This watercourse empties itself into a reservoir between the barrack and the town of Ashton.

There is no drainage from the privies; their contents are led into large cesspits precisely similar to those at Bury, and placed immediately outside the barrack walls. The consequence is, that the privies are most offensive. They require to be reconstructed as water latrines, but before this could be done, it will be necessary to determine what is to become of the drainage. It would, in our opinion, be improper to turn it into the watercourse, even if there were no local objections to it, unless, indeed, a suitable deodorizing and filtering tank were constructed, in which case the fluid might be passed almost colourless into the stream, and the solid part might be removed and carted away. Unless the sewage could be applied to irrigate land at a sufficient distance from the barrack, it will be necessary to deodorize it in the manner stated.

The only other thing would be to pass it into the sewers of Ashton, if the distance be not too great. In any case, however, an outlet should be obtained, for the privies should not be allowed to remain as they are; they should be reconstructed as soon as possible, and should have divisions and half-doors, with additional light from skylights, in the proportion of one and a half square foot per seat. The urinals should have water laid on.

There are two ablution houses, with a bath and footpans in each. An additional bath and gratings are required.

There are two kitchens with boilers, but without any means of roasting meat. A proper roasting oven should be supplied to each.

There is no laundry; there are women's washhouses, with washing tubs and trays, but without drying stoves. One such stove is required in each wash-house.

The ash-pits in this barrack should be disused, and provision made for the daily collection and removal of the barrack refuse in iron carts.

The barrack is lit by candles. It would be a great improvement to introduce a ventilated gas-burner into every room.

There is a good school-room and library; they require ventilation. There is no day-room.

There are no married quarters; there is a good site available for them outside the barrack.

There is no covered shed for drill.

*The Sanitary Improvements we would advise for these Barracks are the same as those for Bury, and comprehend:—*

1. Reduction of numbers of men in the rooms, so as to leave 600 cubic feet of space per man.
2. Ventilation of the barrack-rooms, guard-room, school-room, and library by shafts and inlets for air.
3. An additional bath to be provided in one of the lavatories, and the lavatories to have gratings and pegs.
4. A drying stove for each wash-house.
5. A roasting oven for each cook-house.
6. Water supply to be improved by enlarging the barrack supply main.
7. Privies to be converted into water latrines, with suitable drainage for the disposal of the soil. Divisions of seats, half-doors, and sufficient light to be provided.
8. Barrack refuse to be collected and removed in iron carts, instead of being kept in ash-pits.

This barrack should be lit with gas, by a ventilated burner in each room.

Rooms for married soldiers are much required, as are also a day-room and drill shed.

*Ashton Barrack Hospital.*

This hospital is constructed on the same plan, and has the same accommodation, as the hospital at Bury, except that the wards are narrower.

It consists of four wards with offices, and a central staircase and corridor for affording access to the upper flat, on which the wards are placed. The following table shows the accommodation:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| 1 | 6 | 3 | 3 |
| 2 | 9 | 6 | 3 |
| 3 | 6 | 3 | 3 |
| 4 | 9 | 6 | 3 |
| 4 | 30 | 18 | 12 |

The present wards would afford accommodation for no more than 18 sick, at an average of 1,200 cubic feet per bed.

The other defects are similar to those in Bury hospital:—

The wards are not ventilated.

There is no proper lavatory.

The bath-room requires a fixed bath, with hot and cold water.

There are no water-closets, but only privies in the back yard, inconveniently placed for the sick, and very offensive.

There is no accommodation for the sick of soldiers' families.

The wards are only lit by candles, although there is gas in the passages.

*To remedy these Defects we would recommend:—*

1. To reduce the beds so as to give, as nearly as may be, 1,200 cubic feet of space for each.
2. To ventilate all the wards by shafts and inlets for air, and also to reconstruct the fireplaces to admit fresh warm air in winter. Also to ventilate the kitchen by a shaft.
3. To provide a suitable water-closet, built out from the hospital, with access from passage. To convert the privy of the itch ward into a water-closet, and to reconstruct the privies in the back yard as water latrines.
4. Bath-room to be provided with a fixed bath, with hot and cold water, and suitable lavatory arrangements to be provided in the bath-room.

Lastly, each ward should be lit by a ventilating gas-burner. A room should be provided for the sick of soldiers' families.

## 7. FULWOOD BARRACKS, PRESTON.

These barracks are situated on high ground in the open country, about one mile and a half from the town of Preston. They cover an area of 27 acres, on a marly subsoil, with good means of natural drainage, but there is no outlet for the barrack drainage, except into a small stream passing through other peoples' properties. The river, which is the proper drainage outlet, is two miles and a quarter distant. The water supply is derived solely from wells, and the drainage is disposed of by being led into cesspits, from whence any overflow escapes into the small stream already mentioned.

The barracks are constructed to contain 1,142

non-commissioned officers and men, infantry, cavalry, and artillery, and were completed for occupation in the year 1848. The buildings are arranged in two squares, separated from each other by the officers' quarters and the hospital. The infantry barracks occupy two opposite sides of the first square next the entrance gate, and the guard-rooms, entrance gate, chapel school, and officers' quarters form the other two sides of this square.

The cavalry and artillery barracks occupy two sides of the other square.

The arrangement of the buildings is similar to that at Ashton and Bury, viz., the blocks occupied by the soldiers front the parade ground. Behind them, with a sufficient interval, are placed the cook-houses, cleaning sheds, &c. Behind these, with a further interval, the privies, urinals, and ash-pits, built against the boundary wall, and immediately outside the walls the large cesspits of the establishment.

The rooms run through the buildings, and have doors entering from either side of a passage or staircase; there are two rooms entering from each passage, and two rooms above entering from each staircase. The buildings have the great advantage of having only two flats of rooms, and only four rooms in each house. Each house has a passage right through it, a form of construction which greatly assists ventilation and convenience of access.

The following table shows the regulation accommodation, the actual occupation, and the available accommodation at 600 cubic feet per man of these barracks :—

| Barrack Rooms. | Total Regulation Accommodation. | Total actual Occupation. | Total Accommodation at 600 Cubic Feet per Man. | Total Deficiency of Regulation Accommodation at 600 Cubic Feet per Man. | Excess of present Occupation over available Accommodation at 600 Cubic Feet per Man. | Present Regulation Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|---|---|
| Infantry Square, West | | | | | | | |
| 14 | 224 | 252 | 168 | 56 | 84 | 16 | 12 |
| 14 | 210 | 238 | 168 | 42 | 70 | 15 | 12 |
| 2 | 20 | 24 | 18 | 2 | 6 | 10 | 9 |
| Cavalry Square, West | | | | | | | |
| 6 | 96 | 132 | 96 | — | 36 | 16 | 12 |
| 1 | 12 | 12 | 12 | — | — | 12 | 12 |
| Infantry Square, East | | | | | | | |
| 14 | 224 | 266 | 168 | 56 | 98 | 16 | 12 |
| 14 | 210 | 238 | 168 | 42 | 70 | 15 | 12 |
| 2 | 10 | 10 | 8 | 2 | 2 | 5 | 4 |
| Cavalry Square, East | | | | | | | |
| 6 | 96 | 132 | 96 | — | 36 | 16 | 16 |
| 2 | 12 | 12 | 10 | 2 | 2 | 6 | 5 |
| 75 | 1,114 | 1,316 | 912 | 202 | 404 | — | — |

This table shows that the infantry barracks have, according to existing regulation, 200 occupants more than they could contain at 600 cubic feet per man ; that the cavalry barracks are not overcrowded when occupied up to the regulation number ; that both cavalry and infantry barracks, at the time the return was made to us, had 404 men in them more than they could hold at 600 cubic feet per man, and that the then occupation exceeded the present regulation number by 202 men.

The total available accommodation, at 600 cubic feet per man, is sufficient for 912 men, and no more.

Two rooms only in the cavalry barracks have one man each, by regulation, more than they ought to contain, but these two men could be removed into other cavalry rooms, and this trifling redistribution of inmates is all that is required for the cavalry barracks ; the deficiency of regulation accommodation for 200 men therefore refers solely to the infantry barracks, every room of which contains more men, by existing regulation, than it ought.

The rooms are generally light ; they have one, two, four, and six windows each, according to their size. The rooms generally are deficient in ventilation, although some provision has been made for it. In the upper rooms there are circular openings in the ceiling, passing into the roof ; these are not sufficient for the renewal of the air in the rooms. These openings should have an area of not less than 12 square inches per man, and they should be connected horizontally by a shaft carried up through the roof, and 12 feet high.

There are circular openings in the ceilings of the lower rooms, which appear to communicate only with the space between the ceiling and the floor above ; these rooms should have shafts carried up to the roof, with an area of 11 square inches per man.

Inlets for air near the ceiling, between the windows of each room, with perforated zinc covers and regulating valves, are also required.

The grates are large, and waste a great deal of heat ; they might be remodelled with advantage, and made to warm the air admitted during winter.

There is no day-room nor drill shed for the men in these barracks.

There are four ablution-rooms situated in the ranges behind the barrack-rooms ; they have water laid on to 25 taps. There are no gratings for the men to stand on, and there are not sufficient pegs for the men to hang their things on while washing. Ventilation, by means of a louvre in the roof of each ablution-room, is required.

There are no baths. A proper bath-room, with a bath for every 100 men, would be a great improvement, but for this and for other purposes of health a larger water supply would be necessary.

There are two cook-houses next door to the ablution-rooms. The grates of the boilers might be advantageously reconstructed to save fuel and to cook more satisfactorily. The ventilation of the kitchen is not sufficient, and more ventilation through the roof by means of a louvre is required.

There are no means of roasting or baking meat in either of the kitchens. A roasting oven of sufficient size should be supplied to each.

There are two cleaning sheds in rear of the infantry barracks.

The women's wash-house in the barracks is good, but requires a drying stove.

The urinals are good, but are not supplied with water.

The privies have no drainage, except into cesspits, situated immediately outside the wall. They were most offensive, and require reconstruction as water latrines, with divisions and half-doors, and sufficient light.

The water supply is not sufficient at present to give water for flushing latrines or for other sanitary purposes. It is obtained from the roofs and from 14 pump wells. There are 10 ordinary supply tanks, and eight fire tanks. It is stated that if a well at the end of the barracks were deepened, a very much larger supply could be obtained. If this were done it would be necessary to put up a small steam engine to pump water ; or a windmill with a reservoir tank.

The town of Preston has a water supply, and it might be more economical to lay down pipes to bring it than to incur the constant cost of steam power and attendance.

Whenever a sufficient water supply is obtained, the privies should be improved as described, and flushed daily. But the flushing of the privies would render it necessary to obtain an outlet for the drainage, by applying it to grass land in the neighbourhood, or, in default of this, the removal of the cesspits to a sufficient distance from the barracks, and some arrangement for deodorization. In this case the overflow might pass into the present outlet for the surface drainage, and the solid part would have to be carted away. Probably, double filtration, first, through some porous material, and then through charcoal, would be the simplest plan for deodorizing the sewage.

The workshops are pretty good, but the tailors' shop requires an Arnott's silk flap ventilator, and an inlet for air.

The shoemakers' shop is used as a store.

There is gas in the barracks, but not in the barrack-rooms generally. The infantry serjeants' mess has gas. We are of opinion that a ventilated gas-burner should be introduced into each of the barrack-rooms.

The cavalry barrack-rooms are over the stables; they are similar in construction to those at Bury barracks.

The stables require ventilation, and to effect this, shafts should be carried up from the corners to above the roof, to prevent the effluvia entering the barrack-room, and perforated panes of glass should be placed in the stable windows.

The manure pit is too deep, and, by being so, the drainage from it is apt to saturate the subsoil.

All the ash-pits in the barracks are uncovered and undrained. It would be easy to dispense with them by an organized system of daily collection and removal of barrack refuse by iron carts.

There are 80 sets of married quarters attached to these barracks. They are in 10 houses of two flats, arranged in a single line. Each house has a passage and stair, going completely through from front to back, and giving access to eight rooms, four on each flat. Each room constitutes a married quarter. They are of good size. They have each a ventilator in the ceiling and one over the door. They are simple in arrangement, well constructed, and healthy, and with some alterations of detail, might be made the ground-work for model married quarters.

The rooms have each about 1,600 cubic feet of contents. Married quarters should never be of less cubic dimensions than this.

The grates have no oven for baking. An arrangement for warming the air in a fire-brick compartment behind the fireplace, previous to its being admitted into the room, would be very desirable in future buildings of the kind. An air shaft carried up in the chimney stalk, with a ventilator of perforated zinc over the door or window, would insure better ventilation.

There are cupboards in the rooms; pegs are required for hanging clothing on.

It might also be desirable to supply a small lock-up safe to each room, in the passage, or in some place where, being conspicuous, it must be kept clean.

The outbuildings, consisting of wash-house, laundry, &c. are placed behind the quarters, and between them and the main building is a spacious yard, where clothes are hung to dry.

The privies are defective, and should be converted into water latrines, with means for flushing.

The ash-pit was in a most objectionable condition, the smell from putrefying refuse thrown in being very offensive. The barrack refuse ought to be removed daily in an iron cart and the ash-pit abolished.

The wash-house is pretty good; but the drying room is not formed upon the best principle; it should be reconstructed, with a properly arranged stove and horses.

The chapel school requires inlets for air.

The light and ventilation of the guard-room are both defective, and would be much improved by the insertion of perforated slabs of glass into those of the loop-holes, now blocked up by brick. Slabs of glass inserted into the roof of the front verandah, above the windows, would also greatly improve the light.

*The following are the Sanitary Improvements required in these Barracks:—*

1. Reduction of numbers in the barrack-rooms to the extent pointed out.
2. Ventilation of all the barrack-rooms by shafts and inlets for air of the sections specified. The chapel school, guard-room, and tailors' shop to be ventilated as described.
3. The ablution-rooms to be provided with gratings for the men to stand on, and with additional pegs.
4. Bathing accommodation to be provided in the proportion of one bath to every 100 men.
5. A roasting oven of sufficient size to be provided for each of the cook-houses. Additional ventilation for the cook-houses to be provided.
6. Wash-house to be provided with a drying apparatus.
7. Increased water supply to be provided.
8. Sewerage and drainage to be improved, as pointed out, and all cesspits near the barracks to be abolished.
9. Privies in the barracks and married quarters to be reconstructed as water latrines, with divisions and half-doors, and light in the proportion of one and a half square foot of glass for every seat. Urinals to be supplied with water for cleansing.
10. Stables to be ventilated as described.
11. A service to be organized for collecting and removing the barrack refuse in iron carts, daily, and ash-pits to be discontinued.

It would be a great improvement to introduce a ventilated gas-burner into all the barrack-rooms; and day-rooms and drill sheds should be provided. It would also improve the married quarters to add an oven to each grate.

*Fulwood Barracks Hospital.*

The hospital of Fulwood barracks consists of two separate establishments, one for cavalry, the other for infantry. The whole building consists of 10 wards with 96 beds, and the offices for this small amount of accommodation are mostly in duplicate. The general construction of the building is defective; it is too complicated. The wards are most of them not sufficiently supplied with windows, and the means of natural ventilation are defective.

The following is the ward accommodation as compared with what it would be at 1,200 cubic feet of space per bed:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| Cavalry, No. 1 | 8 | 5 | 3 |
| „ No. 2 | 8 | 5 | 3 |
| Infantry, No. 1 | 8 | 5 | 3 |
| „ No. 2 | 9 | 7 | 2 |
| „ No. 3 | 9 | 7 | 2 |
| „ No. 4 | 8 | 5 | 3 |
| „ No. 5 | 6 | 5 | 1 |
| „ No. 6 | 8 | 5 | 3 |
| „ No. 7 | 9 | 6 | 3 |
| „ No. 8 | 9 | 6 | 3 |
| „ No. 9 | 8 | 5 | 3 |
| „ No. 10 | 6 | 5 | 1 |
| Total - 12 | 96 | 66 | 30 |

In this table we have divided the cubic space in the wards, as near as may be, in the ratio of 1,200 cubic feet per bed, and it appears that the two divisions of the hospital contain space for no more than 66 beds.

Each ward has two circular openings in the ceiling for ventilation, but these are not sufficient; and we are of opinion that a shaft will have to be carried up from the ceiling of each ward to above the roof of the hospital, to give egress to the foul air, and that proper inlets for the air near the ceiling will have to be provided. The fire-grates might be readily altered to economize heat, and warm the inflowing air during winter, by having brick channels for the purpose introduced behind the fire.

There are gaslights in the passages, but none in the wards. It would, in our opinion, be advisable to introduce a ventilated gas-burner into each ward.

The arrangement of baths, lavatories, and water-closets, in this hospital, is in principle good. They are all placed in a detached building behind, but connected with the hospital by a corridor. The

water-closets are stated to be liable to get out of order. Otherwise the arrangements are sufficient.

The kitchens are also detached, and are sufficiently supplied with means of cooking. The kitchen on the cavalry side is complained of as being too small, but at the time of our inspection the cavalry hospital was occupied by infantry sick, for whom more kitchen accommodation was required.

The water supply, like that of the barracks generally, is derived from rain-water, and a well. It is forced up for the baths, &c. by means of a force pump.

The water-closets are drained into a cesspit. The same remarks apply to the hospital drainage, as have been made with respect to the drainage of the barracks.

There is no accommodation for the sick wives and children of soldiers, of whom 80 families live in the adjoining married quarters.

We have been struck, in examining the various regimental hospitals in different barracks, and in this one amongst others, with the great and unnecessary complication and want of simplicity, and consequent costliness of their structure.

The buildings are usually cut up in an excessive number of small wards; and in some instances there are apparently as many nooks and corners of one kind and another as there are patients.

It would, in our opinion, be most advisable to adopt some general principles of construction applicable to regimental hospitals, by which the first cost, as well as the subsequent expense of administration, may be reduced. We have hardly seen a single regimental hospital that may be pronounced as being in all points suitable for sick, and if there has been any exception to this rule, it has been where the building was not originally intended for a hospital.

Simplicity of structure, with abundance of light and natural ventilation by the windows, are those conditions which are required for the welfare of the sick, and for cheapness and efficiency of administration.

It would be difficult, at any cost, to render most of the present buildings suitable for sick. All that can be done with them, is to remove the defects that are positively injurious to health. But, while making what we conceive to be the recommendations necessary for this object, we would beg to suggest whether regimental hospitals on a better model might not be gradually constructed for all barracks where they may be required? The existing hospitals would not be lost to the country, for in almost all barracks there is accommodation of three kinds wanted; namely,—additional barrack accommodation, married quarters, and stores. For one or other of these objects, many of the existing hospitals might be appropriated, if suitable alterations were made in them.

*With regard to Fulwood Barrack Hospital, we would recommend:—*

1. Reduction of the numbers in each ward, so as to allow as near as may be, 1,200 cubic feet per bed.
2. Ventilation of all the wards in the manner pointed out.
3. Improving the drainage and water supply of the hospital along with those of the barracks.
4. A ventilated gas-burner should be introduced into each ward.
5. Accommodation for the sick of soldiers' families should be provided.
6. It would be advantageous to place a door in the passage leading to the water-closets, to prevent any effluvia from them from entering the hospital.

We have the honour to be, &c.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.
*Barrack and Hospital Improvement Commission, October* 15, 1858.

## YORKSHIRE DISTRICT.

SIR,

WE have the honour to transmit the following report on the barracks and hospitals at York, Leeds, and Bradford, together with the sanitary improvements required for each.

### 1. YORK CAVALRY BARRACKS.

These barracks are situated about a mile to the south of the city of York, in an open district, at a short distance from the left bank of the river Ouse. The ground within the boundary is a long parallelogram, projecting back from the public road. The buildings are arranged along the sides, and at one end of the enclosure. At the extremity opposite the entrance gates, are placed the officers' quarters, with the hospital on one side, and the riding school on the other. At right angles to these, and extending along the two sides, are two ranges of stables with barrack-rooms over them. The barrack offices, ash-pits, manure heaps, &c., are built against the boundary wall behind the ranges, and at a short distance from the men's windows. Nearer the gate on either side are the infirmary, stables, library, and reading-room, saddlers' and armourers' shops, canteen, fives court, tailors' and shoemakers' shops, forges, guard-room, and cells. The canteen is opposite the guard-room, and there are two entrance gates; but as the guard-room is situated at some distance from one of them, it has been suggested that it would be a great improvement to reconstruct it between the gates.

There is a spacious parade and exercising ground enclosed by the ranges of buildings. The parade ground near the officers' quarters appears to be in good condition, but the half of the ground nearest the entrance gate is imperfectly drained, and becomes wet and sloppy in rainy weather. The whole should be properly subsoil drained, which is the only means of remedying the defect.

The men's accommodation consists of 26 barrack-rooms and three attics, and there are 15 non-commissioned officers' rooms, affording accommodation by existing regulation for 336 non-commissioned officers and men, the particulars of which as regards the men's rooms are as follow:—

| Rooms. | Total Regulation Number of Men. | Total Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 26 | 208 | 208 | — |
| Attics:— | | | |
| 1 | 30 | 30 | — |
| 3 | 40 | 35 | 5 |
| 4 | 30 | 30 | — |
| | 308 | 303 | 5 |

The apparent deficiency of accommodation is only for five men at 600 cubic feet per man, but the actual number in barracks when the return was made to us slightly exceeded the regulation number. For instance, in attic No. 1, instead of 30 men, there were crowded together 11 men, 11 women, and 27 children, making 49 inmates in all, while in attic No. 4, there were 37 men instead of 30. The regulation space in the 26 barrack-rooms is about 555 cubic feet per man. If one man were removed from each barrack-room, the space for seven remaining men would be about 635 cubic feet per man.

Following our usual practice as regards barracks

in open situations, we do not in the present instance recommend any reduction in the inmates of these rooms, but in attic No. 3, five men should be removed, as well as every excess in any of the rooms over the regulation number, which ought on no account to be exceeded.

The arrangement of barrack-rooms is similar to those of most other cavalry barracks. A long corridor, 9 feet 6 inches high, runs from end to end of the range. In the present instance these corridors are reached by two stone staircases at equal distances from the ends of the ranges. In one range the corridor has a window at each end ; in the other range there is a window at one end, but the light and ventilation at the opposite end is cut off by the school-room, which extends across the end of the corridor. Both light and ventilation are deficient in these corridors, and will have to be improved by carrying up shafts from the ceiling through the attics to the roof. These shafts should be the square of the entire breadth of the corridor, and should be covered above with large ventilated skylights, and plastered inside. The end windows should have perforated glass panes put into them for ventilation.

The barrack-rooms open right and left out of the corridor ; they are all 28 feet long, by 16 feet 8 inches wide, and 9 feet 6 inches high. They have one large window to the outside, and one small window opening into the corridor. The door, as is usual in this class of rooms, opens close to the fire, and opposite the window, preventing the thorough ventilation of the room. We would recommend that an additional window be opened at the dark end of each barrack-room, and that the door be removed from its present position to the further end of the room.

None of the rooms have any efficient means of ventilation ; there are two openings in the ceiling communicating apparently with the outer wall, but they are of little use, as the plan is defective. We would recommend that all the existing openings be closed, and that a shaft be carried from one corner of each room to above the roof, and that each room have an inlet for air of the usual construction.

The fire-grates are of the old pattern, and should be remodelled to warm part of the air admitted during winter.

There are non-commissioned officers' rooms in each range : they are not sufficiently ventilated, and require silk flap ventilators in the chimneys.

The barrack-rooms are lighted with gas, and we are glad to state that an improvement has been introduced in ventilating the burners on the same principle recommended by us for other barracks.

The attics over the barrack-rooms are not equally good ; one of them is dark, and has no means of ventilation, and the roof is not lined, so that the interior is hot in summer, and cold in winter although heated by stoves. This attic has a few dormer windows on one side only. The other attic has been considerably improved by having dormer windows put into both sides, and by a partial ceiling through which there are ventilating openings into a space under the ridge, which again is ventilated by louvres. It was stated to us that similar improvements were about to be carried out in the other attic. We would, however, advise that in both cases additional light should be introduced by skylights in the darker parts of each attic. The roofs of the attics require lining and plastering.

The serjeants' mess is in the attic of one range ; part of it is partitioned off for a kitchen and living room for the mess servant. It requires ventilation through the roof.

At the time we inspected these barracks a strong ammoniacal odour pervaded the lower barrack-rooms immediately over the stables. This arose partly from defective ventilation in the stables, partly from their defective drainage, and partly from the want of litter sheds, and the litter being piled up under the men's windows.

The stable ventilation requires improvement by four shafts, one from each corner to be carried up through the roof, the shafts to have an aggregate area equal to 12 square inches per horse. The gratings over the stable doors should be removed, and a window substituted. The stables require proper draining. At the present time there are two cesspits outside each door, into which the whole drainage runs, and from whence it overflows into the gutters and creates nuisance. The stables should be suitably drained along with the barracks, and these cesspits removed ; litter sheds should also be erected at a sufficient distance from the stable doors.

There is a school-room at the end of one of the barrack ranges. It was originally a soldier's room, taken from the construction, and enlarged by throwing a partition with a window in it across the end of the corridor in such a way as to obstruct its ventilation. It would to very advisable to erect a suitable school-room, and be restore the present room to its original destination, but in the meantime a shaft and inlet, and a remodelled grate, should be provided for it as for the barrack-rooms.

There is a small detached cottage building, in which are two very small rooms, one of which is used as a library, and the other as a reading-room. The accommodation afforded is of the most limited character, and the reading-room should either be sufficiently enlarged, or another room built. The present rooms should be ventilated by a silk flap ventilator into the chimney, and glass louvres in the windows.

There are two ablution-rooms, one in each range, situated within the building, and at the foot of the staircase. They have slate tables and basins, with water laid on ; but the tables have no ledges ; there are no gratings nor pegs, and neither of the rooms is ventilated. These deficiencies should be supplied.

At the end of each ablution-room furthest from the outer wall, there is a small dark closet under the staircase. The closet contains a circular cast-iron tub, 4 feet in diameter, and 2 ft. 2 in. deep, occupying almost the entire area of the closet. This tub is used as a bath, and is supplied with water by a tap. The whole arrangement is exceedingly defective, and we should recommend the tubs to be removed, and a proper bath put up instead. The bath-room should be improved both in construction and lighting as far as practicable ; but the position is a bad one, and does not admit of much improvement. Something, however, might be done with it, but it would be much better to provide separate bathing accommodation.

There are two wash-houses, one behind each range. One of these houses has fixed tubs 4 feet long, and 2 feet broad, with cold water laid, and plugs for emptying. The tubs are divided from each other by partitions, and there are gratings for the women to stand on. It has two boilers, and is roomy, light, and well ventilated, but it has no means of drying or getting up linen, although there is sufficient space for a proper laundry and drying stove. The other wash-house is by no means so good. It requires fixed tubs, gratings, ventilation through the roof, and a proper drying stove. Each range has a cook-house at the foot of one of the staircases, in an apartment corresponding to the one occupied by the lavatory. Each cook-house is provided with boilers and an iron oven. The boilers are arranged along the wall, and have a species of cupola over them for carrying off the steam. The oven is imperfectly constructed, and is not sufficiently ventilated for roasting. This latter defect admits of remedy by enlarging the present openings in the door. Additional ventilation should be given to each cook-house by perforated glass panes in the upper window sashes.

There are four cleaning-rooms fitted with benches. There is no drill shed. There are four workshops for tailors, shoemakers, armourers, and saddlers.

The tailors' and shoemakers' shops are far too small, and barrack-rooms have to be misappropriated to find the requisite accommodation, when there is any extra

work to do. The present shops require ventilation through the roof.

There is a good and sufficient water supply, derived from the works of the York Water Company. There are besides seven pumps supplied by wells.

The whole drainage of the barrack requires improvement.

The present outlet appears not to have sufficient fall to drain the exercising ground. It is stated that a sufficient fall could be obtained by carrying the drain across the road to the river Ouse. At any rate the exercising ground should either be drained or raised.

All the barrack latrines require drainage. At the present time they empty into cesspits, the contents of which are periodically removed. They are close to the barrack ranges, and are in a noxious condition. There is an abundant water supply for converting the whole of them into water latrines, which should be done without delay. They should be drained to an outlet, and the cesspits abolished. When reconstructed, they should have divisions of seats, half-doors, light, and ventilation.

Adjoining the present privies are manure pits and ash-pits. Both are too close to the barrack-rooms, and should be removed to the end of the ranges, in which situation they should be raised a little above the surface, properly paved and drained, and their contents frequently removed. It would be much better, however, to provide for the daily removal of the whole barrack refuse.

The paving and guttering behind the stables are both defective, and foul water was lying on the surface under the windows of the barrack-rooms. The surface should be repaved with square setts, and the gutters properly laid.

There is a good riding-house, but it is too dark and not sufficiently ventilated. It requires skylights in the roof and louvres in the ridge. There is a tolerably good guard-house, but it is not sufficiently ventilated. It requires a shaft and inlet and a remodelled grate to warm part of the admitted air. This guard-room is almost the only one we have met with, in which sufficient cubic space is allowed for the men on guard. The amount allowed is 600 cubic feet per man. The cells open out of a passage at the back of the guard-room. They are warmed by a stove, but the passage is not sufficiently ventilated. Panes of perforated glass should be put into the passage window to remedy this defect. The canteen tap-room and the non-commissioned officers' room require silk flap ventilators into the chimneys, and perforated panes of glass in the windows.

Married quarters are much required in these barracks. There are none at present, excepting such accommodation as can be found in the men's rooms.

*The following are the Sanitary Improvements for these Barracks:—*

1. The small reduction of numbers in attic No. 3 as stated.

2. Ventilation and lighting the corridors by two shafts the square of the breadth of the corridor, carried up to the ridge, plastered inside, and covered above by ventilating skylights. Panes of perforated glass to be put into the corridor windows.

3. Each barrack-room to have an additional window at the dark end, and the door to be removed to the end of the room furthest from the fire. Each room to be ventilated by a shaft and inlet, and to have a remodelled grate. School-room to be ventilated by a shaft and inlet. Non-commissioned officers' rooms to be ventilated by silk flap ventilators.

4. Roofs of attics to be lined and plastered inside. The unimproved attic to have additional dormer windows, and ventilation through the roof. Both attics to have skylights to increase the light when required. Non-commissioned officers' mess-kitchen to be ventilated through the roof.

5. Stables to be ventilated by shafts as described, and to have windows placed over the doors.

6. Library and reading-room to be ventilated by silk flap ventilators, and a glass louvre in the upper window sash. Canteen tap-room and non-commissioned officers' room to be ventilated by a silk flap ventilator and perforated glass panes in the windows. Workshops to be ventilated through the roof. Riding school to have additional light and to be ventilated through the roof. Guard-room to be ventilated by a shaft and remodelled grate. Passage leading to the cells to be ventilated by panes of perforated glass.

7. Ablution-room to have ledges put to the tables, gratings and pegs supplied, and panes of perforated glass in the windows. Present baths to be removed. Bath-rooms to be improved, and two proper baths, with water laid on, put up in each.

8. Wash-houses to be provided with drying and laundry stoves. One of the wash-houses to have fixed tubs, with water laid on, gratings, and ventilation, similar to those in the improved wash-house.

9. Cook-houses to be ventilated by perforated panes in the windows. Additional ventilation to be given to the ovens to make them roast meat.

10. Barrack drainage to be improved, and a better outlet obtained if possible. Surface drainage to be improved by under-draining the exercising ground, and by better paving and guttering behind the stables. Cesspits to be abolished. Privies to be drained and reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation. Manure pits and ash-pits to be removed to a greater distance from the barrack-rooms, and to be properly constructed, paved, and drained, or the whole barrack refuse to be removed daily. Proper litter sheds to be provided.

*York Barrack Hospital.*

This hospital is a small square building situated in a corner of the barrack yard, close to the end of one of the stable ranges. It has no enclosure, no back yard, and no means for convalescents exercising.

It has a central passage and staircase, out of which on the ground floor are entered the surgery, kitchen, serjeants' room, and one small ward used at present as a store. On the floor above are three wards, and at one corner of the largest ward is a door leading into the upper flat of an outbuilding containing two very small badly lighted water-closets, with a narrow lobby out of which they enter. One of these closets is very defectively lighted. Underneath these closets, and entering from the open air, is a small store, in which there is a shower bath, and at a short distance are the hospital privies, placed like those of the barracks, over cesspits. The water-closets are drained into an open ditch in the adjoining field, and this ditch gives off noxious effluvia in certain states of the weather.

The hospital has regulation space for twenty-two beds, alloted among the wards as follows:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 - - | 4 | 2 | 2 |
| 2 - - | 4 | 2 | 2 |
| 3 - - | 4 | 2 | 2 |
| 4 - - - | 10 | 6 | 4 |
| Total - | 22 | 12 | 10 |

These wards will accommodate 12 beds, at as nearly as may be 1,200 cubic feet per bed. At the present time they have the appearance of being very much overcrowded; and the ward atmosphere was close and offensive, notwithstanding the provisions which have been made for ventilation. These consist in openings in the ceiling, covered with wooden slides, and ventilating tubes over the gas-burners. The means of renewing the air would be insufficient even were the numbers reduced in each ward, as

suggested above, and it is therefore necessary to increase the ventilation.

This we would recommend to be done as follows :—

Wards 1, 2, and 3 should each have a large silk flap ventilator introduced into the chimney, and an inlet for air close to the ceiling. The inlet to be covered within the ward by a cornice of perforated zinc for diffusing the air.

Ward No. 4 has two fire-places, one of which might be dispensed with, if the grate of the other were remodelled to heat part of the admitted air. We should propose to close up one of the fire-places, and to make an opening into its chimney flue close to the ceiling of the ward. This opening should have a sectional area double that of the flue, and it ought to be covered by a grating with large openings. Besides the foul air shaft this ward ought to have two inlets, one at each end, with cornices of perforated zinc, of the usual construction. All the other wards, as well as ward No. 4, require remodelled grates.

The dark water-closet should have light given to it by a window through the outer wall. This window should be capable of being opened for ventilation.

Additional ventilation should be given to the staircase by a shaft through the ceiling, and by perforated glass panes in the windows.

All the wards are lighted with gas, and the burners are ventilated by tubes with funnels into the chimneys. This great improvement should be introduced into all hospitals where gas is available.

There is neither lavatory nor fixed bathing accommodation in this hospital. A proper bath-room, with hot and cold water laid on, and an ablution table should be provided.

There is a good kitchen, provided with means of cooking, but it is under a sick ward, and should be ventilated by having a shaft 9 inches square carried up in one corner through the ward to above the roof. It should also have perforated glass panes in the windows.

Water is obtained from the town supply.

This hospital is small for the force in barracks, and its limited accommodation is further reduced by one of the wards being taken as a pack store. Additional space might be obtained in one of two ways, either by enlarging the entire building on a healthy plan, or by providing accommodation for the surgery, kitchen, and pack store in adjacent out-buildings, which might be so arranged as to obtain an enclosed space for convalescents.

There are three wards at present in use, and if this plan were carried out three additional wards would be obtained. Many small hospitals might have their ward accommodation similarly extended. The three wards in York hospital at present in use have space for 10 beds, while the force for which there is space in the barracks amounts to about 300 non-commissioned officers and men. The facts are sufficient to show that in one way or other more bed space should be obtained.

*The Sanitary Improvements required for the present Buildings are the follwing :—*

1. Reduction of regulation number of sick in each ward to the extent stated.

2. Ventilation of the three small wards by silk flap ventilators and inlets. Ventilation of the larger wards by converting one of the chimneys into a foul air shaft, and by two inlets for fresh air as described. Kitchen to have a shaft and perforated glass panes for ventilation. Staircase to be ventilated by a louvre through the roof, and by perforated panes in the windows.

3. Additional light to be given to the dark water-closet.

4. A bath-room, with a fixed bath, and hot and cold water laid on, and an ablution table to be provided.

5. Hospital to be drained to a proper outlet along with the barracks. The hospital privies to be drained and converted into a water latrine, and the cesspit to be abolished.

## 2. Leeds Barracks.

These barracks are situated to the north of Leeds, and at the outskirts of the town, in a comparatively open situation. They occupy elevated ground with a good fall for drainage. The officers' quarters are in one block, and the men's barracks are in two blocks, extending in a line along the highest side of the ground, which originally had a rapid slope to the front and at the eastern end. An esplanade has been formed in front of the barrack ranges, from the edge of which the ground sinks to the boundary wall, leaving only a narrow space, on which have been constructed infirmary, stables, orderly room, barrack offices, workshops, &c. On the slope at the eastern end of the barracks are the library, school-room, and riding school. Below these is the hospital, and a little below the hospital is the cavalry exercising ground. This ground is undrained, and is quite useless in wet weather or during winter, at which time it is often necessary to exercise the horses along the public roads. The ground might be drained and rendered sufficiently firm by underdraining at the depth of four feet below the surface, the drain tiles being laid from 10 to 15 feet apart. We are informed that both surface and subsoil drainage could be completed for about 300*l*.

The barracks have been built much too close to the boundary wall, and the dungheaps, privies, washhouses, cook-houses, &c. are close to the men's rooms, so close indeed that there is great nuisance experienced from them, especially during summer weather.

The barrack-rooms are built over the stables, and are reached by two spacious stone staircases in each range. At the top of each stair there is a lobby passing from front to back, lighted by two windows, and from the centre of these lobbies a long gloomy corridor runs from end to end of each range to give access to the soldiers' rooms, which open right and left out of it. This corridor is very imperfectly lighted by a window at each end, and by the cross light of the staircases and barrack-rooms ; and it has no sufficient means of ventilation.

To remedy this defect, and at the same time to increase the light, it will be necessary to carry up two square shafts the entire breadth of each corridor from its ceiling to the ridge, and to cover the top of the shafts by ventilated skylights. These two shafts should be carried up in the space between the staircases as nearly as possible at equal distances from each other, and from the stairs. Each of the windows of the corridors and staircases should have panes of perforated glass introduced for ventilation.

The men's barrack-rooms are 28 in number, and are all of a size, namely, 26 feet 9 inches long, 24 feet 2 inches wide, and 9 feet 10 inches high, and each is intended to contain 12 men with 529 cubic feet of space for each. The following table shows the total accommodation, with what it would be at 600 cubic feet per man :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 28 | 336 | 308 | 28 |

By removing one man out of each room a sufficiently close approximation to 600 cubic feet per man will be obtained.

The rooms have each one large window 9 feet wide, and 4 feet 6 inches high, in the middle of the outer wall, and this window, from being better placed than is usually the case with cavalry barrack windows, lights the room sufficiently. These windows open by sliding. There is another window opening from each barrack-room into the corridor intended to supply a certain amount of borrowed light to the latter.

The doors are close to the fire-places, as they generally are in similar barracks; this is an arrangement which makes the rooms cold, uncomfortable, and occasionally smoky. The arrangement answers no good purpose, and should be altered, and the door removed to the end of the room furthest from the fire-place.

Each room has three sliding ventilators in the ceiling, opening into the space under the roof. This plan of ventilation is ineffective, and should be done away with by carrying up a louvred shaft from the central opening to above the roof, and by providing an inlet for fresh air with a perforated zinc cornice close to the ceiling over the window.

The fire-grates are of a very inefficient and wasteful construction, and ought to be remodelled to warm part of the admitted air in winter. Besides the men's room, there are eight serjeants' rooms opening out of the corridors. These rooms require silk flap ventilators into the chimneys.

All the barrack-rooms are lighted with candles, although gas can be obtained. We would recommend a gas-burner to be introduced into each room, and if placed under the ventilating shafts we have advised for each room, it would not be necessary to provide any other means of carrying away the effluvia from the burners.

Foul air shafts are required for all the stables, to prevent the effluvia from passing into the men's rooms. One such shaft should be carried from each of the four corners of each stable to above the roof of the ranges. These four shafts should have an aggregate sectional area equal to 12 square inches per horse, and they should be carefully lined inside with perforated zinc to prevent the escape of effluvia into the rooms.

The paving and surface drainage of the stables and back yards are in a very defective condition. Foul water lies in the gutters. The sewer gratings are insufficiently trapped, and the stable litter is piled up against the walls directly under the men's windows.

These defects should be remedied by paving the stables outside as well as inside with square setts, by proper guttering, and by more careful trapping of the gratings. As already stated, part of the nuisance so much complained of arises no doubt from the narrowness of the stable yard, and the close proximity of dungheaps, latrines, &c. to the barrack-rooms. It would be most advisable to obtain ground to widen these yards, and this should be done with as little delay as possible. The narrowness of the space behind the stables is a cardinal defect in these barracks, but in the meantime much may be done to remedy the evil by removing the dungheaps and ash-pits, and by re-constructing the latrines. Proper litter sheds would have at the same time to be provided against the back boundary wall. These improvements ought to be carried out at once, but to do so it will be necessary either to provide for the daily removal of the whole barrack refuse by the contractor, or to find space for dungheaps and ash-pits at a sufficient distance, and barrows for conveying the manure to them.

There are four ablution houses built against the back boundary wall. They are very narrow, on account of the confined space in which they stand. They have the requisite conveniences for washing, but there are no pegs, and the houses are not ventilated. As the roofs are of corrugated iron perhaps the best method of ventilation would be to fill the top rows of all the windows with perforated glass panes.

There are no baths, but we have been informed that two have been authorized in this year's estimates. There should be four baths for the strength in barracks.

Each soldiers' range is provided with a cook-house supplied with boilers and iron ovens. The buildings are not sufficiently ventilated, and require louvres in the roof. These cook-houses are very narrow and confined for space, and occasion much inconvenience to the troops in their present state.

The whole barracks have an abundant and constant water supply from the Leeds Waterworks, for which great advantage 80*l.* a year are paid on contract.

Although the surface drainage of the cavalry exercising ground has yet to be carried out, the barracks themselves are drained into the town sewers, and the latrines have been recently connected with the drainage, and water is laid on for flushing them out. The arrangement is by no means a good one. The receptacles are too deep, and there was considerable nuisance from them at the time we were there. It would be much better to convert them into proper water latrines, in which water would always stand at a sufficient level to ensure cleanliness of the receptacles. The seats are partly divided by brick walls, to which we would recommend the addition of half-doors.

Much nuisance proceeds from the position and state of the urinals during warm weather, to remove which we would recommend their being supplied with water for cleansing.

The riding house is deficient both in light and ventilation, and ought to have skylights in the roof, and louvres along the ridge, to remedy these defects.

There is no proper laundry connected with these barracks, although there is a wash-house exhibiting the usual deficiencies. It requires fixed tubs, with water laid on, ventilation through the roof, and a proper drying stove.

There are two school-rooms, one for adults and the other for infants; the latter was once a stable, and is at present used as a store. Complaint is made that the place is damp, on account, apparently, of want of means of renewing the air within. The room is large, and not well lighted, as it has windows only at one end. It ought to have two ventilating shafts carried up from the corners opposite the door, and two inlets over the windows. A stove is used for warming the room, to obtain the full effect of which it would be necessary to admit air under the floor to enter the room round the stove.

The adult school-room should have additional ventilation by inlets of the usual construction; it has openings in the ceiling to act as outlets. The serjeants' mess requires ventilation by a shaft and inlet, as does also the library. The latter should have a remodelled grate to warm part of the admitted air in winter.

There are the following deficiencies in the accommodation of these barracks:—There are no day-rooms, cleaning-rooms, nor married soldiers' quarters.

There is one workshop each for armourers, shoemakers, tailors, and saddlers. There are two forges and a shoeing shed. The shoemaker's, tailor's, and saddler's shops require ventilation by shafts and inlets.

The canteen tap-room and non-commissioned officers' room require silk flap ventilators into the chimney, and perforated panes of glass in the windows for ventilation.

Additional ventilation should be given to the guard-room by a shaft and inlet, and by a remodelled grate. Perforated panes should be introduced into the passage window leading to the cells.

The adjoining defaulters' room has openings in the ceiling for ventilation, but the plan is not a good one. The central opening should be converted into a shaft carried above the ridge.

*The following is a Summary of the Sanitary Improvements required for Leeds Cavalry Barracks:—*

1. Reduction of the numbers of men in each room to the extent stated.

2. Ventilating and lighting the corridors by shafts with skylights, as described, and by perforated glass panes in the corridors and stair windows.

3. Ventilating the men's rooms by shafts and inlets, and by remodelled grates. Removing the doors of the men's rooms from their present position to the other end of the room; ventilating the non-commissioned officers' rooms by silk flap ventilators.

4. Introducing gas into all the barrack-rooms, school-rooms, library, &c.

5. Ventilating the stables by shafts carried up from the corners to above the roof; improving the paving and drainage of the stables.

6. Ventilating the workshops, serjeants' mess, school-rooms, defaulters' room, guard-room, and library by shafts and inlets, as described; the library and guard-room to have remodelled grates; infant school-room to have air introduced round the stove. Ventilating the canteen tap-room and non-commissioned officers' room by silk flap ventilators and perforated glass panes. Ventilating and lighting the riding-house by louvres along the ridge and by skylights.

7. Yards behind the stable ranges to be repaved with square setts, properly guttered, and the drains trapped. Ash-pits and manure heaps to be removed; litter sheds to be constructed against the back boundary walls; yards to be widened by obtaining additional ground, if possible.

8. Ablution houses to be supplied with pegs, and to have perforated glass panes in the upper row of each window. Four baths with water laid on to be provided.

9. Present cook-houses to be ventilated by louvres, or to be reconstructed, widened, and ventilated.

10. Cavalry exercising ground to be under drained.

11. Latrines to have receptacles in which water will stand, and to have half-doors. Urinals to be improved and supplied with water.

12. Women's wash-house to have fixed tubs and water laid on, a drying stove, and ventilation through the roof.

### *Leeds Barrack Hospital.*

This hospital is situated near the foot of the slope at the eastern end of the barrack ranges, and close to the cavalry exercising ground. It is only one story high, and consists of two wings, with one ward in each, connected by a centre, which consists of a corridor behind, and of two small wards in front. A verandah has been carried along the centre on the south side. The entrance is in the middle of the length of the centre. It passes through and through the building, and is connected with the kitchen, wash-house, bath-room, &c. by a covered verandah.

These offices are built at right angles to the line of the hospital and are in the yard behind. The situation of the buildings is a very bad one, and their general structure and arrangement are ill adapted for the purposes of a hospital.

The adjoining cavalry exercising ground, which is some three or four acres in extent, becomes a complete swamp after wet weather, and it is some time before the moisture dries up. Two of the hospital wards are dark and gloomy, and the bath-room has to be reached by walking in the open air across an undrained court. As a whole, the building does not admit of much improvement, and the best thing which could be done would be to erect another hospital, and turn the present building to some more suitable purpose. We shall therefore confine our recommendations to the most necessary points.

The building had originally six wards for sick. Two of these wards have, however, been taken from the construction for the surgery and orderlies' room. The remaining four wards have regulation accommodation for 25 beds, arranged as follows:—

| Wards. | Regulation Number of Beds. | Number at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 - - | 10 | 6 | 4 |
| 2 - - | 2 | 1 | 1 |
| 3 - - | 3 | 1 | 2 |
| 6 - - | 10 | 6 | 4 |
| Total - | 25 | 14 | 11 |

The two larger wards have four windows each, and are sufficiently lighted. The two smaller wards have each one window, and are gloomy. They should accommodate no more than one bed each, while the two large wards might have six beds each, although the cubic space would be somewhat under 1,200 cubic feet per bed.

The building certainly should not have more than 14 beds in the present wards. Each of the larger wards has six openings through the ceiling to the space under the roof for ventilation. This arrangement is not sufficient, and we are of opinion that a louvred shaft should be carried up above the ridge over the middle of each ward. Two inlets for air should also be provided close to the ceiling, one at the side and one at the end of each ward. These inlets should be of the usual construction. The two smaller wards are not ventilated, and we should propose that each should have a silk flap ventilator into the chimney, and a Sherringham's ventilator above the window.

Each of the larger wards has an old pattern grate, which wastes much fuel. We would recommend their being replaced by remodelled grates constructed to warm part of the admitted air.

A few panes of perforated glass should be put into the upper row of the corridor windows. The wards are lighted by candles, although there is gas within the building. A ventilated gas burner should be introduced into each ward.

Behind the kitchen, and entering from the back yard, is a room in which the sick wash, but it has no proper means of ablution. There is a shower bath in it, and two slipper baths. In its present state this room is unsuitable for its purpose. The bath and ablution room should be much nearer the hospital, or at all events should be connected with it by a covered communication. The present room should, therefore, either be changed for another, or it should be made accessible under cover.

A fixed bath, with hot and cold water laid on, should be constructed, and a proper ablution table, with sunk basins and water laid on, should be provided.

There is no laundry for getting up hospital linen.

The kitchen appears to be sufficiently supplied with the requisites for cooking.

Water is derived partly from a spring, and partly from the Leeds Waterworks, but the water is not properly laid on to the building. It is raised from tanks by pumping, while it could be laid on at pressure.

The hospital sewerage is in a very defective state. An open gutter descends the slope from the stables above, and empties itself into a drain immediately in front of the hospital. The smell from this gutter and drain are said to be very offensive in summer.

The water-closet and other drainage from the hospital is discharged into a cesspit about 200 yards distant, which is emptied periodically.

There are two water-closets in a small building carried out behind the corridor. They are supplied with self-acting pans, but they should be properly drained, and the cesspits abolished. The whole hospital drainage should, in fact, be improved along with that of the barrack, and the offensive gutter and drain in front done away with.

*The Sanitary Improvements we would recommend for this Hospital are as follow:—*

1. Reduction of the number of beds in the wards to the extent stated.

2. Ventilation of the wards by shafts and inlets as described, and perforated glass panes to be inserted in the corridor windows. Remodelled grates to be put into the two larger wards.

3. Lavatory and bath-room to be re-arranged, and to have a covered communication with the hospital. A proper ablution table and a fixed bath, with hot and cold water laid on, to be provided.

4. Gas burners to be introduced into the wards.

5. The hospital drainage to be conducted to an outlet, and the cesspit abolished. The offensive gutter and drain in front of the hospital to be done away with.

6. Drainage of the exercising ground has been already recommended, but disallowed. Its proximity to the hospital affords an urgent reason for the improvement being carried out if the hospital is to be left where it is.

### 3. Bradford Moor Infantry Barracks.

These barracks are situated about a mile from the town of Bradford, on the top of Bradford Moor, on a high, airy, healthy position, within an enclosure $7\frac{1}{2}$ acres in extent. They consist of a number of buildings of different dates, the older parts of which were originally a farmhouse and cottages, converted into barrack-rooms, stores, hospital, &c.; while the newer buildings were erected in the years 1851–52. There are houses outside the boundary, but the site is essentially in the country. The river Aire passes within $1\frac{1}{4}$ miles of the barracks. The subsoil is rocky, and the means of natural drainage sufficient. The buildings are mostly of stone and a small part of brick; they vary considerably in character. The newer buildings run parallel with the boundary wall, in which is the entrance gate. The older buildings are close to one of the boundary walls, and run at right angles to those already mentioned. The old and new buildings thus bound two sides of the parade ground; while a third side is bounded by four detached brick huts of recent construction. The newer buildings and huts are alone at present occupied as soldiers' quarters. The old cottages are used for married soldiers, workshops, the canteen, stores, stables, &c. The whole of these cottage structures are hardly fit for occupation. We have been informed that they have been long condemned, and unquestionably the best and most economical course to take would be to sweep them all away, and to replace them by more suitable structures.

The men's new barrack-rooms are in two blocks, which differ somewhat in structure. They are each two stories high, and are divided by staircases into separate houses, having four rooms to a house. The rooms run from front to back of the blocks, and have two windows on two sides. In one of the blocks the passages and staircases have been boxed off from the men's rooms, reducing the cubic contents of the rooms, and depriving the rooms of one of the windows. In the other block the passages and staircases are carried through and through the building, which is a far better construction both for light and ventilation.

Between these blocks and the boundary wall, at the distance of a few yards from the windows, are a range of old offices, ash-pits, urinals, &c., which are quite unnecessary in such a position. These in our opinion should be cleared away, and as the space is rather narrow, we should propose to place on it only the more necessary buildings at present required to complete the barrack arrangements. The total regulation accommodation in the new buildings is for 183 non-commissioned officers and men, the details of which are given in the following table :—

| Rooms. | Regulation Number of Men. | Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 14 - - | 168 | 140 | 28 | 12 | 10 |
| 2 - - | 12 | 10 | 2 | 6 | 5 |
| Total - | 180 | 150 | 30 | — | — |

To give rather less than 600 cubic feet per man it will be necessary to restrict the occupants in each of the fourteen 12-men rooms in the table to ten men per room, and to restrict those in the two 6-men rooms to five men per room.

None of the rooms are ventilated. They each require a shaft to be carried from the ceiling to above the roof, and two inlets for air, with perforated zinc cornices, one on each side between the windows and close to the ceiling. There are two or three small rooms in one of the blocks, one of which is used as an infant school. These rooms should have a silk flap ventilator into the chimney. All the staircase and passage windows in the two new blocks should have perforated glass panes in the upper sashes for ventilation.

The rooms are warmed by the old pattern grate. Grates remodelled to warm part of the admitted air in winter should be provided.

The huts have porches and a ceiling through which there are openings for ventilation, but they are not sufficient. We would propose to carry a shaft from the centre of the ceiling directly through the roof, and to leave two of the existing openings in the ceiling for inlets, provided a piece of open wire gauze or perforated zinc be put over them. Each hut has regulation space for 19 men at 310 cubic feet per man. With this number the huts are overcrowded, and we would propose to reduce the regulation number to 16 men per hut, which will raise the cubic space to that allotted at Shorncliffe camp. The grates in these huts should also be remodelled.

The barrack-rooms are lighted by candles. Gas should be introduced instead, when it can be obtained.

There are two lavatories, one belonging to the hut barracks, the other is a mere lean-to shed behind the barrack blocks. The former of these has washing benches and basins, but no gratings or pegs, and it has no ventilation. These deficiencies should be supplied, the last by a louvre in the roof. The washing shed behind the blocks is quite unsuitable for its purpose. It ought to be removed entirely, and a proper ablution-room, with benches, basins, water laid on gratings, pegs, light, and ventilation, should be constructed along the boundary wall in a position as convenient as possible for the barrack-rooms. There are no baths at present. Two baths, with water laid on, should be provided in connexion with the new ablution-room.

The women's wash-house is a low dark room in the oldest part of the buildings. It is destitute of the necessary conveniences, and not fit for its purpose, and it would be of little use to spend money in improving it. A new wash-house should be built, with fixed tubs, boilers, water laid on, a drying stove, &c.

A certain amount of very defective accommodation for married soldiers is afforded in attics formerly used as barrack-rooms over stables. The buildings altogether are in so dilapidated a condition that they hardly admit of being improved.

There are two cook-houses; one for the barrack blocks, the other intended for the huts. The former has six boilers and two iron ovens; the latter has two boilers and one oven: it requires ventilation through the roof.

A room in the old farm-house answers the purpose of a library. It is unventilated, and requires a silk flap ventilator into the chimney.

The tailors' and shoemakers' shops are in the old cottage buildings, and are scarcely fit for occupation. Better accommodation for trades is absolutely required.

There is no day-room nor covered drill shed, and the canteen is a very defective building; in short we must repeat that, with the exception of the new barrack blocks, the huts, and the newly-built offices connected with them, there are no buildings within the boundary fit for occupation as soldiers' quarters.

A great defect in these barracks is the present

condition of the water supply. There are two pump wells, and the roof-water is collected in two tanks for use. It is stated that there is an abundant and excellent supply of water within a mile of the barrack, but at the present time an artesian well is being sunk within the barrack boundary. It was about 100 yards deep at the time the return was made to us, and is not yet finished.

At one corner of the enclosure there are newly constructed latrines, which are drained into a cesspit outside the boundary ; they are in a very defective state from want of water, and as soon as a proper water supply is obtained they should be converted into water latrines on Macfarlane's principle, which would remove all nuisance with a minimum expenditure of water. The urinals should also be supplied with water. Close to the latrines is a new ash-pit, which may be used with safety, but all the old ash-pits should be abolished forthwith as already recommended. Notwithstanding the elevated position of the buildings, the parade ground is in a bad condition for want of drainage ; it should be under drained.

The guard-room has no ventilation ; it requires a shaft and inlet, and a remodelled grate. The window in the passage leading to the cells should have panes of perforated glass in the windows.

*The Sanitary Improvements required for Bradford Moor Barracks are as follow :—*

1. Reduction of the inmates in the barrack-rooms and huts to the extent stated, and the evacuation of the old buildings.

2. Ventilation and warming of the barrack-rooms, and huts by shafts, inlets, and remodelled grates. Passages and staircases to be ventilated by perforated glass panes in the windows. Small rooms and infant school-room in the barrack blocks, and the library, to be ventilated by silk flap ventilators. Guard-room to be ventilated by a shaft, inlet, and remodelled grates.

Passage leading to cells to be ventilated by perforated panes.

3. A new ablution house, with two baths, to be provided for the barrack blocks. Ablution house behind the huts to have gratings, pegs, and ventilation through the roof.

4. Parade ground to be drained ; water supply to be improved.

5. Latrines to be reconstructed, with receptacles to hold water and proper divisions, half-doors, and ventiation. Urinals to be supplied with water.

6. The new ash-pit to be filled up to the level of the ground, paved and drained. The old ash-pits and manure pits behind the barrack blocks to be abolished.

*Bradford Moor Barrack Hospital.*

This hospital consists of three small cottages, which were originally purchased with the ground, four of the top rooms of which have been converted into sick wards. The accommodation is so miserably deficient that it is unfit for the sick ; it is in fact just such a place as in civil life sick poor are removed from to be sent to hospital. The following is the accommodation :—

| Wards. | Present Number of Beds. | Number at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 - - | 4 | 2 | 2 |
| 2 - - | 4 | 2 | 2 |
| 3 - - | 4 | 1 | 3 |
| 4 - - | 4 | 1 | 3 |
| Total - | 16 | 6 | 10 |

The place has no lavatory, bath, laundry, provision, or bedding store. It has no water-closet, but only two very offensive privies at one end.

We would recommend its abandonment as soon as possible, and the construction of a suitable hospital adapted to the size of the barrack. To diminish the risk incurred by the current sick in such a building, *we should recommend as follows :—*

1. The immediate reduction of the number of sick in the wards to the extent stated.

2. Providing each ward with a silk flap ventilator into the chimney, and a Sherringham's ventilator for an inlet.

Sidney Herbert.
John Sutherland.
W. H. Burrell.
Douglas Galton.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, June* 3, 1859.

## NORTHERN DISTRICT.

Sir,

Having inspected and made inquiry into the sanitary condition of the barracks and hospitals at Newcastle-on-Tyne, Sunderland, Tynemouth, and Carlisle, in the Northern District, we have the honour to report the result as follows :—

### 1.—NEWCASTLE BARRACKS.

These barracks are situated in an airy, open position on Newcastle Moor, to the north of the town and at its outskirts. They stand within an area of 10a. 3r. 2p., but although the amount of ground is amply sufficient for every purpose of such a barrack, the stables and barrack-rooms are built too close to the boundary wall, and as a result of this the dung-heaps, ash-pits, and latrines are brought much too close to the men's rooms, and give rise to nuisance.

The narrow yard between them and the barrack-rooms is paved with boulders, which renders both cleansing and surface drainage difficult. This form of paving should be gradually removed, and proper square setts laid down both in the stables and along the ground outside back and front.

The buildings are of brick, and were constructed about the year 1804. The subsoil on which they stand is clay. The fall of the ground is amply sufficient for every purpose of good drainage, and there is an outlet close at hand into the town sewers.

The barrack-rooms are in two blocks in line, separated by an entrance in the centre, and there is a third block, containing three large arched rooms within a separate enclosure, a little below the middle of the parade ground, in a building which was formerly the powder magazine. The first two blocks, K. and B., are two stories in height. The lower story in both blocks is occupied by stables and ablution-rooms, over which are the men's rooms, reached by long, steep, and narrow wooden stairs, with the rooms opening right and left at the top. At right angles to these blocks, at one end, and separated from them by a short distance, is a large block of officers' quarters, behind which are barrack offices, &c., and behind these is the canteen. The hospitals are at the lower end of the enclosure.

The barrack is intended for occupation by either cavalry or infantry, or both, and contains 26 men's rooms and 14 non-commissioned officers' rooms, with regulation space for 476 non-commissioned officers

and men. The following table shows the accommodation in the men's rooms :—

| Rooms. | Present Regulation Accommodation in Men. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| K. Range. | | | |
| 1 - - | 14 | 12 | 2 |
| 2 - - | 14 | 12 | 2 |
| 3 - - | 14 | 14 | — |
| 4 - - | 14 | 12 | 2 |
| 5 - - | 14 | 14 | — |
| 6 - - | 14 | 14 | — |
| 7 - - | 14 | 14 | — |
| 8 - - | 14 | 12 | 2 |
| 9 - - | 14 | 14 | — |
| 10 - - | 14 | 14 | — |
| 11 - - | 14 | 14 | — |
| 12 - - | 14 | 12 | 2 |
| 13 - - | 14 | 14 | — |
| 15 - - | 14 | 14 | — |
| 16 - - | 14 | 12 | 2 |
| B. Range. | | | |
| 1 - - | 24 | 14 | 10 |
| 2 - - | 24 | 14 | 10 |
| 3 - - | 24 | 14 | 10 |
| 4 - - | 24 | 14 | 10 |
| 5 - - | 24 | 14 | 10 |
| 6 - - | 24 | 15 | 9 |
| 7 - - | 24 | 14 | 10 |
| 8 - - | 24 | 14 | 10 |
| M. Range. | | | |
| 1 - - | 20 | 20 | — |
| 2 - - | 20 | 20 | — |
| 3 - - | 20 | 20 | — |
| Total - | 462 | 371 | 91 |

The rooms in K range are not much over-crowded, and will hold within 12 of the present regulation number at rather less than 600 cubic feet per man. The rooms in B range are excessively over-crowded. The rooms in M range would, so far as concerns cubic space, hold more than their present number of occupants, but the space is all above the beds, because the magazine consisted of long, lofty, narrow, arched vaults. At present the distance between the beds every way is not more than a foot, so that in reality these rooms are over-crowded with 731 cubic feet per bed.

All the rooms have some provision for ventilation, but it is of such a nature as to render further ventilation necessary. In range K the rooms are back to back, with a number of openings between them, the only result of which is the intermingling of the foul atmosphere of the different rooms. They have also gratings communicating with the open air. In range B the rooms run through and through, and have windows on both sides, but they are of considerable breadth in proportion to their height.

It is essentially necessary that each barrack-room be ventilated by itself, and to effect this we would recommend that in each barrack-room in K range a louvre be carried from the ceiling through the roof, close to the division wall, forming the back of each room, to act as an outlet. Two inlets for air, close to the eaves, would also have to be provided. In range B two louvred shafts should be carried from the centre line of the ceiling to above the roof, and inlets should be provided close to the eaves, one inlet to be on each of the opposite sides of the room. The rooms should have remodelled grates to warm part of the air admitted in winter ; and when these ventilating arrangements are completed, all the other ventilating openings, whether between adjacent rooms or to the open air, should be closed. The 24 men's rooms in B range are only 8 feet high, a height quite disproportionate to their other dimensions. They are in fact 4 feet lower than the rooms in K range, and 9 feet lower than those in M range, which latter, however, are disproportionately high. It would be most advisable to raise the ceilings of B range to obtain sufficient height for the rooms, which they certainly have not at present, and the want of which is the reason why these rooms are so overcrowded by their present inmates.

The rooms in M range should have more light by enlarging the windows, and they should have two shafts carried up through the soffit of the arch, one at each end, and the fire-grates should be remodelled to warm part of the admitted air in winter.

In B range there are a number of serjeants' rooms at the top of the staircases which require silk flap ventilators into the chimneys. Each of the staircase windows should have panes of perforated glass in the upper rows, to improve the ventilation.

The rooms are lighted by candles, although gas is obtainable. We would advise one or more gas burners to be introduced into each barrack-room. The burners should have funnels and tubes for ventilation, and the end of the tubes should be turned up into the outlet ventilating shafts. In the rooms where the burners can be placed directly under the shafts, no tubes are necessary.

A library which occupies a barrack-room in B range requires ventilation by shafts, inlets, and a remodelled grate, like other barrack-rooms. Gas should also be introduced into it.

There is a large and excellent chapel school, but it is deficient in ventilation. It requires openings in the ridge, and air to be admitted under the floor to enter round the stoves, so as to be warmed in winter. Generally the rooms have too little window space.

There are 15 serjeants' rooms, besides as many serjeants' berths, taken off the barrack-rooms. Each room requires ventilation by a silk flap ventilator in the chimney.

There is no serjeants' mess, but a portion of a building occasionally used as a hospital, though eminently unfit for sick, is occasionally used as a non-commissioned officers' mess room.

There is a small infant school, which requires a remodelled grate. The schoolmistress's quarters require a window in the back wall for ventilation.

The stables are lofty and spacious, but they are not sufficiently ventilated, and precautions are required for preventing the effluvia passing upwards into the men's rooms above.

A shaft should be carried from the ceiling at each corner of each stable to above the roof, and the shafts should have a conjoint area of 12 square inches per horse.

There are three ablution-rooms, with space for 134 men at a time. One is a stable under K range, another similar room is under B range, and there is a smaller one adjacent to M range. All of these ablution houses require beads to the tables to keep the water from splashing over on the men while washing. They also require gratings, pegs, and forms. The ablution-rooms under K and B houses require two ventilating shafts carried from the ceiling above the roof of the ranges. The ablution shed at M range requires a skylight, and ventilation through the roof.

There are no baths. Five baths, with water laid on, are required, and there is ample space for them in the present ablution-rooms.

Each of the three ranges has a women's wash-house, all of which are defective in several important particulars. They all require roof ventilation, fixed tubs, with water laid on, gratings to stand on, and drying and laundry stoves.

There are two cook-houses, with old-pattern boilers and steam tubes. Recently, ovens have been put up of a model common in Newcastle. The consumption of coal in these cook-houses is very large, when com-

pared with that in the improved cooking ranges at Woolwich and in the Wellington Barracks.

Newcastle barracks are abundantly supplied with water from the town water mains, wells, tanks, &c.

As already stated, the drainage outlet is into the town sewers. Into these sewers the latrines are flushed, and they are so constructed that about six inches of water stand in them. This, however, is not sufficient to prevent nuisance from them being experienced in the barrack-rooms, and, besides, they are otherwise in a very defective state, and will require reconstruction, with proper water receptacles, divisions, half-doors, light, and ventilation.

Adjoining the latrines, which are built against the boundary wall fronting the public road, are the ashpits and manure heaps. They are much too close to the men's rooms, and ought to be removed from their present position altogether, to a safe distance beyond the end of the ranges. The space now occupied by them might be advantageously used for erecting litter sheds, of which there are none at present. The manure receptacles and ashpits should, when reconstructed, be raised above the surface and drained, and arrangements should be made for the frequent removal of all barrack refuse. The urinals should be reconstructed near the latrines. They should have proper divisions and should be supplied with water.

There are two guard-rooms ; one of these, the main guard, has no ventilation, but there are openings through the wall into the roof over the adjacent provost cells, which are, hence, really ventilated into the guard-room, especially when the guard-room fire is lighted, and the door closed. These openings should be built up, and a shaft, two inlets from the open air, and a remodelled grate should be provided for the guard room.

The provost cells are entered through the serjeants' room, which is dark, and requires more light, and ventilation by a silk flap ventilator into the chimney. The ventilation of the cells passes into the roof, but in order to render it efficient there should be a louvred opening in the ridge above.

There is no lock-up, except an apartment in one of the barrack ranges under a soldiers' room. It is not well adapted for its purpose.

Opposite the main guard-room is a picket guard-room, which requires ventilation by a shaft and remodelled grate.

The canteen tap-rooms require [silk] flap ventilators in the chimneys, and perforated panes in the windows.

These barracks have no day-room. They have no accommodation for married soldiers whose wives are allowed in barracks ; and they have no shoemakers' shop. There are wheelers', armourers', saddlers', and tailors' shops. These all require ventilation by inlets, shafts, or silk flap ventilators where there are fireplaces.

There is no special covered drill shed, but a spare shed, 70 feet long by 30 feet wide, and 17 feet high, is sometimes used for the purpose.

Cleaning is done in two narrow passages under K range, but there are no special cleaning sheds.

*The following is a Summary of the Sanitary Improvements required for Newcastle Barracks :—*

1. Reduction of overcrowding in each room to the extent stated in the table.

2. Ventilation of each barrack-room by shafts, inlets, and remodelled grates ; ventilation of the non-commissioned officers' rooms by silk-flap ventilators in the chimneys ; ventilation of the stables by shafts from the corners of the ceiling carried up through the roof ; ventilation of the library, chapel, school, and infant school as described ; ventilation of the guard-rooms by shafts, inlets, and remodelled grates ; ventilation of the provost cells and serjeants' quarters ; ventilation of the canteen tap-rooms by silk-flap ventilators ; ventilation of the workshops as described ; ventilation of the barrack-room staircases by perforated panes.

3. Ablution-rooms under ranges K. and B. to have ventilating shafts carried up from the corners to above the roofs. All the ablution houses to have beads to the tables, gratings, pegs, and forms. Five baths, with water laid on, to be provided.

4. Women's wash-houses to have roof ventilation, fixed tubs with water laid on, gratings, and drying and laundry stoves.

5. Privies to be reconstructed as water latrines, with divisions, half-doors, light, and ventilation. Urinals to be properly reconstructed and supplied with water.

6. Manure heaps and ash-pits to be removed from their present position, and reconstructed at safe distances from the barracks, with proper paving and drainage, to be raised above the level of the ground, and arrangements made for conveying away the whole refuse daily.

7. Litter sheds to be constructed on the site of the present manure heaps and ashpits.

This barrack, as a whole, is by no means in good condition, and owes to its exposed position, and not to its structure or sanitary arrangements, any measure of health the troops may enjoy in it.

### *Newcastle Barrack Hospitals.*

There are two buildings appropriated as hospitals for these barracks. They are both situated on the lower side of the parade ground, and the surface drainage from the slopes above gravitates towards them.

One of the hospitals is intended for cavalry sick, the other for infantry. The former has been built for a hospital, the latter was originally a gun-shed. Neither of them has any enclosure in front, and they open directly on the parade ground.

*The Cavalry Hospital* is two stories high. It has a central entrance, passage, and staircase which runs from front to back, and out of this passage a corridor branches right and left, giving access to a small ward at each end of the building, and to a surgery and serjeants' room. Above these are four small wards. The end wards have two windows, one on each end ; the other wards and apartments have one window each. The kitchen is detached in the yard behind, and adjoining it are the privies, ashpits, wash-house, and dead-house.

There are in all six wards and 26 beds. The particulars of the accommodation are as follow :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 5 | 3 | 2 |
| 2 | 5 | 3 | 2 |
| 3 | 5 | 3 | 2 |
| 4 | 3 | 1 | 2 |
| 5 | 3 | 1 | 2 |
| 6 | 5 | 3 | 2 |
| Total - | 26 | 14 | 12 |

By allowing rather less than 1,200 cubic feet per bed in the four largest wards, and allotting one bed each to wards 4 and 5, which is all they ought to contain, there is space for 14 beds in this building. Two beds ought to be taken off the construction of each ward.

A certain provision for ventilation has been made in this building, but it is not effectual, although it can be rendered so. A shaft has recently been carried up from the ceiling of each ward, but, instead of passing directly through the roof to the open air, it terminates under the roof. This arrangement errs against the first principles of ventilation of hospitals and barracks, which require that each ward and room should have a direct and separate communication with the external

air. Each of these shafts, therefore, must be carried up above the roof, and terminated in a separate louvre.

Another error of application has been that of furnishing each shaft at its lower end with a flat sliding cover. This cover was shut in several instances when we were there, and it must be removed from all the shafts to prevent this being done in future.

Glass louvres have been introduced into the windows for admitting air, but they are not sufficient and proper inlets; two for each end ward and one for each of the other wards ought to be provided instead.

The fire-grates are of a very rude and wasteful construction, and should be replaced by remodelled grates to warm part of the admitted air.

The passage and stair windows should have glass louvres or perforated glass panes put into the top sashes.

There is no gas in this hospital. A perfectly ventilated burner is required for each ward, and the ventilating tube should be carried into the lower end of the outlet shaft.

There is no lavatory nor bath-room for the sick, and there are no waterclosets.

A projection might very easily be built behind the back of the staircase to contain two waterclosets, a lavatory with a few sunk basins with water laid on, and a bath with hot and cold water, supplied from the kitchen by means of pipes.

The kitchen is imperfectly furnished with the means of cooking hospital diets, and requires a new range. It also requires roof ventilation.

Adjoining the kitchen is the hospital wash-house, which requires fixed tubs and means of drying linen.

In the yard are privies of a construction similar to those of the barracks, and equally offensive. They require to be reconstructed as proper water latrines; a proper urinal should also be provided.

The drainage of the hospital yard is complained of as defective. It ought to be examined and remedied. Under the same roof with the cook-house and privy is a very offensive ashpit, which ought to be entirely removed, and the refuse ought to be collected in a suitable utensil and carried away daily.

This building has neither provision store, pack store, nor bedding store, and it has no space for receiving the sick of soldiers' families. It is, in fact, quite inadequate in accommodation for the strength of the barrack; it ought to be extended or rebuilt on a better plan.

*The following is a Summary of the Sanitary Requirements for the present Building:—*

1. Removing two beds out of each ward.
2. Carrying each ventilating shaft separately above the roof and terminating it with a louvre; removing the covers from the shafts within the wards; providing suitable inlets for air; remodelling the ward grates; ventilating the stairs and passages by glass louvres or perforated panes.
3. Providing a ventilating gas-burner for each ward.
4. Providing an ablution-room, bath-room, and two waterclosets in a projection behind the stairs.
5. Providing a new kitchen range, and ventilating the kitchen through the roof.
6. Providing fixed tubs for the wash-house, and the means of drying linen.
7. Reconstructing the privies as water latrines; providing a proper urinal; and improving the drainage.
8. Removing the ashpit, and providing for the daily collection and removal of the hospital refuse.

*The Infantry Hospital.*—This building has not been much used as a hospital; but it has been so used, and stands on the construction as a hospital. It is utterly unfit for sick, and cannot without rebuilding be made fit.

***The only recommendation we have to make is, that it be struck off the construction altogether.***

## II.—SUNDERLAND BARRACKS.

These barracks are situated at the eastern end of the town of Sunderland, on an angle of ground bounded on the north side by the river Wear, at a distance of about 100 yards, and on the east by the sea, at a distance of about 250 yards. Part of Sunderland Docks lie between the sea-shore and the barrack boundary. On the other sides there are numerous houses and manufactories belonging to the town, which are separated from the barrack enclosure by a narrow public highway. The situation, however, is open, airy, and healthy, and it is raised about 30 feet above the sea level. There is an area of 7A. 3R. 6P. within the boundary walls. The subsoil is clay and sand.

The buildings are partly of brick and partly of stone, and were erected early in the present century; they are arranged in three detached blocks forming a centre, with two wings at right angles to it. The centre contains officers' quarters, and the men's rooms are in the wings. The usual outhouses are arranged behind the blocks and close to the boundary walls. So far as concerns the general disposition of the buildings it is good, and conducive to free external ventilation.

Each range of men's barracks is two stories high, and is divided into three houses. Each house has an outside stair of stone, giving access to the rooms on the upper floor, and under the stone stair is placed the entrance to the ground-floor rooms. A small projecting porch shelters the upper entrance door.

The rooms open right and left of each entrance. They are, on an average, 38 feet long by about 23 feet wide, and from 8 feet 8 inches to 9 feet high. These proportions are not very good, as they give the rooms an appearance of being low and somewhat gloomy.

The total accommodation is for 316 non-commissioned officers and men. There are 16 serjeants' rooms of sufficient size. Each room gives nearly 1,600 cubic feet per man, but the men's rooms are considerably overcrowded, as will be seen from the following table:—

| Rooms. | Total present Regulation Number of Men. | Total Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Number of Men per Room at 600 Cubic Feet per Man. |
|---|---|---|---|---|---|
| B. Range, 8 rooms (Nos. 5 to 12) | 160 | 104 | 56 | 20 | 13 |
| E. Range, 7 rooms (Nos. 7, 8, 9, 18, 19, 20, 21) | 140 | 91 | 49 | 20 | 13 |
| Total | 300 | 195 | 105 | — | — |

The present number of men per room is 20. Throughout the barracks the space per man, in the great majority of instances, does not exceed 375 cubic feet. To give an average cubic space under 600 feet, it will be necessary to remove seven men out of each room.

The rooms have four windows, two on each opposite side, and there are two wire gauze panes in the windows in each room, which is the only provision for ventilation. The upper sashes of the windows are fixed, and the lower sashes open on pivots.

It will be necessary to ventilate all the rooms by shafts and inlets. One shaft of the required sectional area will have to be carried up from the ceiling of each room to above the roof. Each room will also require two inlets, one on each of the opposite sides of the room, placed close to the ceiling.

Each serjeants' room should have an Arnott's silk flap ventilator introduced into the chimney.

To complete the ventilation during winter, all the

fire-grates should be remodelled to save fuel and warm part of the air admitted.

All the barrack-rooms are lighted with candles, although gas is laid on within the square, and to the canteen. We would recommend that each room have a ventilated gas-burner introduced into it.

The porches belonging to these barrack-rooms would be very convenient places in which to put up night urinals, so as to do away with urine tubs. An earthenware urinal, with an ascending water current and an overflow, similar to the one in use in the Wellington barracks, would be well worthy of trial. It would have to be locked up during the day.

One of the 20-men rooms is fitted up as a school-room. It requires ventilation by a shaft, two inlets, and a remodelled grate like the barrack-rooms. It should also be lighted with gas. There is no day-room.

A room at the end of the officers' range is used as a library. It requires a silk flap ventilator into the chimney, and a gas-burner.

There are four ablution sheds, two behind each men's range, built against the boundary wall. They are very narrow and dark; they have no gratings nor pegs; and they have no beads to the tables.

These sheds require ventilating skylights in the roof, a bead to the tables, and gratings and pegs.

There are no baths, but four are to be provided this year.

Two similar sheds are used as women's wash-houses; one is 7 feet 8 inches broad, and the other is only 5 feet 9 inches broad. Both are inconveniently small, and they have no fixed tubs, gratings, nor drying stove. The adjoining cleaning sheds might be used to extend the washing accommodation, but of course other cleaning sheds would have to be provided.

There is no accommodation for married people, except the serjeants' rooms. Married soldiers whose wives are allowed in barracks sleep in the barrack-rooms with the men. Sufficient married accommodation for a barrack of this size might be possibly obtained by renting a house, and the present practice might at once be put a stop to.

There is no drill shed, and accommodation for trades is much required. At present the armourers' shop is in one of the cleaning sheds. There is no regimental storage of any kind.

An excellent supply of water is laid on to the barracks from the works of the water company.

The barracks are drained into the Wear at the dock basin, and all the privies are connected with the drainage, and can be flushed, but their construction is otherwise imperfect. The troughs are much too deep, and water does not stand in them. The buildings have neither light nor ventilation, except what comes from the door, and the seating is very defective.

These privies should be reconstructed as water latrines, with divisions of seats and half-doors; the buildings should be lighted and ventilated through the roof, and a receptacle, in which water will stand constantly, on the principle of Macfarlane's latrines, should be provided for each privy throughout the barracks.

The ashpits are very defective. They require to be raised above the surface, to be paved and drained, and the refuse to be frequently removed.

There are two cook-houses, one of which is new and of brick. It has boilers and ovens, but it would be improved by having more light. The other cook-house is old, and of wood. It hardly admits of improvement. It is disused at present.

The canteen tap-room and non-commissioned officers' room are low-roofed and unventilated. They require an Arnott's silk flap ventilator in the chimney, perforated panes in the windows, and a ventilating funnel and tube over the gas-burners.

The guard-room is defectively ventilated, and requires a shaft through the ceiling and roof, and a remodelled grate.

*The Sanitary Improvements required for Sunderland Barracks are the following:—*

1. Removing seven men out of each barrack-room.

2. Ventilating each room by shafts, inlets, and remodelled grates. School-room to be similarly ventilated. All the non-commissioned officers' rooms and the library to have Arnott's silk flap ventilators in the chimneys. Guard-room to have a shaft and remodelled grate. Canteen to be ventilated by silk flap ventilators, and perforated panes in the non-commissioned officers' room and tap-room. Gas-burners in the canteen to be ventilated.

3. A ventilated gas-burner to be placed in all the barrack-rooms, school-room, and library.

4. Ablution-rooms to have ledges put to the tables, gratings, and pegs, and ventilating skylights in the roofs. Two baths would be enough for the reduced strength consequent on giving 600 cubic feet per man.

5. Accommodation for washing clothes to be extended, fixed tubs, with water laid on, and drying and laundry stoves to be provided.

6. Privies to be reconstructed as water latrines, with suitable water receptacles, and to have light and ventilation through the roofs, divisions of seats, and half-doors.

7. Ashpits to be improved by raising the bottoms above the level of the ground, draining and paving them, and providing for frequent removal of the refuse.

8. New cookhouse to have more light through the roof.

*Sunderland Barrack Hospital.*

This is a very defective building in which to place sick men. It is only one story high, and its floor rests immediately on the ground. It is situated in the lower angle of the barrack enclosure, with the boundary wall on two sides of it. The hospital itself is in two blocks, placed at right angles to each other; and behind them there are two small confined yards, in one of which is the kitchen and dead-house, and in the other a urinal, privy, and ashpit. There is no enclosure separating the hospital from the barrack yard, and no place for convalescents taking exercise.

In one block of the hospital are placed a nurses' room, surgery, and one ward; in the other block are three wards opening out of each other.

The whole plan and arrangements are so defective that it would be well to consider whether a new hospital could not be provided for this station. We shall, however, deal with the place as it is.

There are in all four wards, with regulation space for 28 beds. A third of the beds have only 427 cubic feet of space each. About another third have under 500 cubic feet, so that the wards are excessively overcrowded.

The following table will show the extent of this:—

| Wards. | Present. Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Bed Spaces. |
|---|---|---|---|
| 1 | 10 | 4 | 6 |
| 2 | 4 | 3 | 1 |
| 3 | 9 | 4 | 5 |
| 4 | 5 | 5 | 3 |
| Total - | 28 | 16 | 15 |

The space in these wards will not divide equally by 1,200, and if a little more than 1,200 cubic feet were allowed to each bed, the hospital would contain 10 beds. Under the circumstances of the case, however, we should advise, for the present at least, that 15 beds be removed out of the wards, in the proportions shown in the table.

The ventilation in all the wards is deficient, and should be provided for by a shaft being carried up from the ceiling through the roof in wards 1, 3, and 4. Ward 2, which has space only for one bed, may have a sufficient outlet by introducing a silk flap ventilator into the chimney. Each ward, except No. 2, should have two inlets for air, and No. 2 should have one inlet. All the wards require remodelled grates.

The passage window requires perforated panes in the upper sash.

The present means of lighting is by candles. A ventilated gas-burner is required for each ward.

There are no proper means of washing or bathing the sick. The shower bath stands in the open air.

A small building having a covered connexion with the sick wards should be provided, and a fixed bath, with hot and cold water laid on, and an ablution table, with sunk basins and water laid on, should be put up in it.

As there is no watercloset for the sick, one such convenience should at the same time be constructed.

There is no hospital wash-house, and there is certainly no room for one in the back yard.

The kitchen is only indifferently provided with means of cooking.

Water is obtained from the water company's works.

In the back yard are flushed privies, which ought to have a receptacle provided for holding water. A small ashpit in the yard should be removed entirely.

There are no stores of any kind.

The dead-house is dark, and requires a skylight.

There is no sleeping accommodation for orderlies, except in the wards.

*The Sanitary Improvements required for this Hospital are:—*

1. Removing 15 beds out of the wards.
2. Ventilating the wards by shafts, inlets, and remodelled grates, and ventilating the passage by perforated panes in the window.
3. Introducing a ventilated gas-burner into each ward.
4. Providing a watercloset connected with the hospital.
5. Providing a bath and a proper ablution table, with hot and cold water laid on.
6. Converting the privies in the yard into water latrines, and removing the ashpit.
7. Providing a ventilating skylight for the dead-house.

## III.—TYNEMOUTH CASTLE.

Tynemouth Castle is situated on a promontory about 100 feet high, with the sea on one side and the estuary of the Tyne on the other. One extremity of the village of Tynemouth comes within about 100 yards of the landward side of the enclosure, otherwise the castle is completely isolated from buildings.

There is an area of 9A. 3R. 15P. within the enclosure. The centre of the area is occupied by the ruins of Tynemouth priory and an ancient burying-ground about to be abandoned. The barracks, canteen, and hospital are situated, as it were, round the priory and burial-ground. The buildings are of brick and stone; part of them date from the Norman period, and part are modern.

The old castle of Tynemouth is situated at the west side of the enclosure, and an archway which passes under it affords the only means of access to the interior. There are four barrack-rooms in the castle, reached by narrow, tortuous, dark stairs; the rooms are large, low-roofed, and defectively lighted, and are not well suited for the accommodation of soldiers.

There are six barrack-rooms in the newer buildings, which are of better construction, and more adapted for their object than the old rooms in the castle.

All of them are overcrowded, and they are all without proper means of ventilation.

The following table shows the present regulation accommodation compared with what it would be at 600 cubic feet per man:—

| Rooms. | Total present Regulation Number of Men. | Total Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A. Range. | | | |
| No. 1 - - | 22 | 14 | 8 |
| „ 2 - - | 23 | 11 | 12 |
| „ 3 - - | 24 | 14 | 10 |
| „ 4 - - | 24 | 18 | 6 |
| B. Range. | | | |
| No. 1 - - | 23 | 16 | 7 |
| „ 2 - - | 22 | 17 | 5 |
| „ 3 - - | 27 | 21 | 6 |
| „ 4 - - | 25 | 20 | 5 |
| „ 5 - - | 22 | 17 | 5 |
| „ 6 - - | 22 | 16 | 6 |
| Total - | 234 | 164 | 70 |

This table shows a deficiency of accommodation for 70 men; and the remainder, namely, 164 men, would have as near as may be 600 cubic feet per man, were the excess of inmates removed from the rooms.

Both ranges of barrack-rooms will require somewhat different methods of ventilation. The upper room in the castle should be ventilated through the roof by Mackinnel's or Muir's ventilator, either of which will act by supplying fresh air and giving exit to foul air. The lower rooms should have outlet shafts of the usual construction carried from the ceiling to above the roof. The chief difficulty in the lower rooms of the castle is to find a means of supplying fresh air, on account of the thickness of the walls.

We should propose to do this in the meantime by placing two squares of perforated zinc or of perforated glass in the upper range of panes in each window. The difficulty of finding inlets for fresh air will also prevent the introduction of remodelled grates of the usual form we have hitherto recommended, instead of which we would recommend a form of grate projecting into the room, and with a contracted draught below, on the principle of the Anglo-American stove.

The more modern rooms in B. range should have shafts, inlets, and remodelled fire-grates. Each room will require one shaft and two inlets.

The staircases in both ranges should be ventilated by panes of perforated zinc or glass put into the windows; and in B. range a shaft about nine inches square should be carried from the ceiling of the staircase through the roof.

The rooms are lighted with gas, but none of the burners are ventilated. They should each have a ventilating funnel and a tube carried from it into the chimney.

A room is used as a school-room and library. It ought to be ventilated like the other barrack-rooms.

There is no day-room nor drill shed.

There are two narrow ablution houses built as lean-to sheds against the ramparts. They have no pegs nor gratings, and there are no ledges to the ablution tables.

These deficiencies require to be supplied.

There are no baths, but it was stated to us that two baths had been authorized.

There is a women's wash-house fitted up with boilers and benches. It requires fixed tubs, gratings, and a drying and laundry stove.

The cook-house is in the old castle, and at a considerable distance from the rooms in B. range.

We were informed that a new one with ovens is about to be built near the rooms in B. range, and the present cook-house is to be abolished.

A better tailors' shop is required. The present one consists of two small flagged damp rooms in the old buildings, quite unfit for their purpose.

An abundant water supply has lately been introduced within the enclosure. It is derived from the company's mains.

The privies are of the usual ladder construction, and are drained to the sea through earthenware pipes. They require sluicing to keep them clean. They should be reconstructed as water latrines on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation.

The urinals consist of stone troughs, and are not of good construction. They should be reconstructed and supplied with water for cleansing.

Ventilation is required for the canteen tap-room and non-commissioned officers' room. It should be given by means of silk flap ventilators and perforated glass panes.

There is no accommodation for married soldiers, except two rooms for staff serjeants, and five berths in the men's rooms. Married women allowed in barracks are accommodated in soldiers' rooms when the occupation admits of it.

*The following sanitary improvements are applicable to all the barracks in Tynemouth Castle;* but even if they were all carried out, we should not advise the rooms in range A. to be constantly occupied. They are not healthy rooms, and should only be used on emergency.

1. Reduction of numbers in all the rooms to the extent stated.

2. Ventilation and warming of the barrack-rooms and library by shafts and inlets, and remodelled grates as described; staircases to be ventilated by shafts and perforated panes; gas-burners to be ventilated; canteen tap-room and non-commissioned officers' room to be ventilated by silk flap ventilators and perforated panes; serjeants' rooms to have silk flap ventilators into the chimneys; guard-room fire-grate to be improved so as to throw out more heat, in the manner advised for the other rooms in A. range.

3. Ablution-rooms to be provided with pegs, gratings, and ledges to the tables. The two baths authorized to be put up, and water to be laid on to them.

4. Women's wash-house to have fixed tubs, gratings, and a drying and laundry stove.

5. New cook-house, with proper means of roasting, baking, and boiling, to be erected in place of the present one.

6. Privies to be reconstructed as water latrines, on Macfarlane's principle, and to have water laid on, divisions of seats, half-doors, light, and ventilation. Urinals to be reconstructed and supplied with water.

### *Tynemouth Castle Hospital.*

The hospital occupies part of what was formerly the governor's house, and the remainder is occupied by the barrack offices and serjeants' quarters. The building is two stories high, with a deep basement beneath. On the ground floor of the hospital, part is the surgery and a sick ward, and the remaining sick wards are above.

The following table shows the accommodation in the wards :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 - - | 4 | 2 | 2 |
| 2 - - | 4 | 2 | 2 |
| 3 - - | 4 | 2 | 2 |
| 4 - - | 9 | 5 | 4 |
| 5 - - | 6 | 3 | 3 |
| Total - - | 27 | 14 | 13 |

This table shows a deficiency of space of nearly one half, and the sick have at present about the same cubic space as that which we have been allotting for healthy men in barracks.

There is, however, a ready way of increasing the accommodation, and that is by devoting all the rooms in the building for sick, and finding accommodation for the medical officer, barrack office, &c. elsewhere. This would add considerably to the space so much required, and we would recommend its being done at once.

There is a good wide hall and staircase; both require ventilation by a shaft carried through the ceiling of the stair, and by perforated glass panes in the stair windows.

The rooms are defectively lighted, with one exception, in which there are three windows to the ward. The other four wards have one window each. In short, the building not having been constructed for a hospital, is not well adapted for one.

None of the wards have sufficient means of ventilation, and they will require shafts, inlets, and remodelled grates. One inlet for each ward will suffice. They are lighted with gas, but the burners require ventilation by funnels and tubes carried into the chimneys.

There is no lavatory and no fixed bath. One bath with hot and cold water laid on, and an ablution table on Macfarlane's principle, should be put up in a convenient position within the building.

There is a watercloset within the building, but not for the use of the sick, who are obliged to go to the privies in the yard behind. The sick should be permitted to use the watercloset when the whole building is given over to them, and the privies in the back yard should be converted into a Macfarlane's water latrine. There is plenty of water at hand, and drainage already exists.

In providing a bath it will be necessary to lay on water to the hospital.

There is a deep damp basement under the hospital; part of it is used for a kitchen for officers. This basement is quite unfit for any purpose connected with a hospital.

In the yard behind is the kitchen of the hospital. It is not properly provided with means of cooking, and requires a proper range.

The hospital stores are in a detached building behind.

*The following are the Sanitary Improvements required for this Hospital :—*

1. Removing all quarters and offices, except those for sick, out of the building, and converting the vacated rooms into wards.

2. Reducing the number of sick in the present wards, and distributing them over the building, so as to give, as near as may be, 1,200 cubic feet per bed.

3. Ventilating the wards by shafts, inlets, and remodelled grates; ventilating the passage and staircase by a shaft through the roof and perforated panes in the windows.

4. Ventilating the gas-burners.

5. Providing a bath and ablution table, and laying on water to the hospital.

6. Converting the privies into water latrines.

7. Providing a cooking range for the hospital kitchen.

## IV.—CARLISLE CASTLE.

Carlisle Castle is situated at the north-west extremity of the town, at its outskirts, and overlooks the open country. It covers an area of rising ground 4A. 1R. 17P. in extent. There are houses and manufactories within a short distance of the boundary, particularly on the side nearest the barracks, and great nuisance is experienced in the rooms from clouds of smoke disengaged from the factory chimneys, no attempt being apparently made to effect its consumption. To such an extent is this nuisance experienced, that it is at times impossible to open the barrack-room windows to admit fresh air.

We are of opinion that legal measures should be adopted to abate the nuisance complained of.

The position of Carlisle Castle is well adapted for drainage. The river Eden passes at a distance of 266 yards from the northern wall. The barrack buildings are of stone and brick. Part are of great antiquity, and the more recent structures date from 1836–37. They are in four ranges, B., E., G., and K. The two former ranges are modern in construction. The two latter are very old. Besides the barrack-rooms in these ranges, there is a single soldiers' room in A. range at the gate.

The barrack-rooms are in some points good rooms, but they are deficient in several important sanitary requirements.

B. range is three stories high, and is built close to the western boundary wall. Besides officers' quarters, it contains three serjeants' rooms and three soldiers' rooms. The latter have four windows each, two at either end of the room. The rooms are 34 feet long by about 20 feet broad, and from 10 feet to 10 feet 4 inches high, and each room has regulation accommodation for 18 men, with an average cubic space considerably under 400 feet per man.

E. range fronts the upper end of the parade ground, at right angles to B. range. It is a single block, consisting of a centre and two wings; part of it was formerly used as an armoury. It is two stories high, and contains 10 barrack-rooms, varying in height from 11 feet 6 inches to 16 feet 9 inches. The rooms are from 30 to 60 feet in length, and from about 15 to 20 feet in breadth.

In the loftier rooms the men have about 630 cubic feet each, without any increase of superficial area for their beds, and in the less lofty rooms the space allowed per man is from under 400 to somewhat under 500 cubic feet.

The larger rooms run through and through the building, and have three windows or two windows in each of the opposite end walls. The smaller rooms are back to back, with three windows each on one side only. The large rooms are rather dark, and part of the window space in them has been built up to form loopholes. It would be very advantageous to these long rooms to provide more light, either by opening additional windows or by enlarging the present ones. Each room in this building has a serjeant's bunk in the corner, which further obstructs the light.

There are two tolerably good lofty barrack-rooms in the old keep, but the remaining rooms are by no means good, and should be occupied only on emergency.

The following table shows the regulation accommodation in all the rooms, compared with what it would be at 600 cubic feet per man:—

| Rooms. | Present Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A. Range. | | | |
| No. 1 | 6 | 3 | 3 |
| B. Range. | | | |
| No. 2 | 18 | 11 | 7 |
| „ 4 | 18 | 12 | 6 |
| „ 6 | 18 | 12 | 6 |
| E. Range. | | | |
| No. 1 | 12 | 12 | — |
| „ 2 | 12 | 12 | — |
| „ 3 | 12 | 12 | — |
| „ 4 | 12 | 12 | — |
| „ 5 | 12 | 9 | 3 |
| „ 6 | 13 | 9 | 4 |
| „ 7 | 14 | 9 | 5 |
| „ 8 | 13 | 9 | 4 |
| „ 9 | 30 | 30 | 2 |
| „ 10 | 33 | 26 | 7 |
| G. Range. | | | |
| No. 1 | 9 | 6 | 3 |
| „ 2 | 9 | 7 | 2 |
| K. Range. | | | |
| No. 1 | 15 | 15 | — |
| „ 2 | 16 | 16 | — |
| Total | 274 | 222 | 52 |

There is accommodation in these rooms for 222 men at very nearly 600 cubic feet per man, but the number 222 exceeds the accommodation available, at least for ordinary occasions. Room No. 1 in A. range, and rooms Nos. 1 and 2, in G. range, as already stated, are only fit for occupation in case of emergency, and as they would hold 16 men at about 600 cubic feet each, these ought to be deducted. The actual good accommodation, therefore, is only sufficient for 206 men.

None of the rooms are ventilated. Those in ranges B. and E. should have each a shaft carried from the ceiling to above the roof, and two inlets for admitting fresh air, placed close to the ceiling, one at each end of the room. All the fire-grates are of the old construction, and might be advantageously remodelled to warm part of the air admitted. The stairs of these ranges should have louvres carried up through the roof, and perforated glass panes in the windows, to keep a current of air through the staircases and passages. The upper flight of stairs in range B. requires a window at the back. Each non-commissioned officers' room should have an Arnott's silk flap ventilator introduced into the chimney. Those in range B. would be much improved by having an additional window at the back.

The barrack-rooms in ranges A. and G. should have shafts and inlets like the others, if the walls and roofs admit of their being introduced. But if not, a large-sized Arnott's ventilator should be placed in each chimney, and a few squares of perforated zinc in the upper row of window panes.

The large men's rooms in the old keep should have Arnott's ventilators into the chimney and perforated zinc squares in the top window frames at each of the opposite ends of the rooms. Remodelled grates are necessary in these and in all cases where chimney ventilators are used, and where the chimney throat is too open below.

Gas is used for lighting the stairs, and candles are used in the barrack-rooms. One or more ventilated gas-burners should be introduced into each barrack-room, according to its size.

There are two ablution-rooms, one for B. range, the other for K. range, with accommodation for 62 men at a time. They are long, narrow, lean-to sheds, built against the rampart walls. They have water laid on by tanks, slate benches, and forms, but the tables have no beads, and there are no pegs nor gratings. These defects ought to be supplied, and the sheds themselves ought to be ventilated by louvres through the roofs.

There are no baths. Two are required, with water laid on.

There is a women's wash-house with two boilers and benches, but it requires fixed tubs, gratings, a drying and laundry stove, and ventilation through the roof.

There are three cook-houses with boilers and recently erected ovens. They are too dark.

Water is derived from wells, tanks, and the water companies' mains. It is said to be sufficient in quantity.

The privies belonging to these barracks are on a very bad plan, and they are very defectively constructed. They are placed over a drain connected with the town sewers, and a small quantity of water is used to flush them. The wall between them and the ashpit is broken through, and the contents of the privies escape into the ashpit; while the pipe drain intended to remove the soil is broken, and allows the fluid part to run on to the parade ground.

The whole should be reconstructed with as little delay as possible. Macfarlane's latrines should be introduced, the drainage rectified, water should be laid on, and the latrines should have divisions of seats, half-doors, and light and ventilation supplied through the roof. Proper water urinals should be at the same time constructed in place of those now in use. The parade ground drainage should be improved at the same time.

The ashpit should be removed entirely, and an iron cart substituted for collecting and removing the refuse once a day.

The canteen tap-room has a partition across part of it to enclose a bed. This ought to be removed, and more light admitted if practicable. The room is too dark at present. It ought to be ventilated by an Arnott's ventilator into the chimney and perforated glass panes in the windows. The room for non-commissioned officers should be similarly ventilated.

The drain and privy behind the canteen are in a very offensive state. A Macfarlane's water latrine should be put up instead of the present privy, the drainage should be improved, and the cesspit abolished.

The school-room is in one of the small rooms near the gateway. Some provision has been made for ventilating it by a shaft carried into the roof. The shaft should be carried up through the roof into the open air, and panes of perforated glass should be placed in the upper window-sashes to act as inlets.

There is a library, a very small room, only large enough to contain the books, but by no means sufficient for a reading-room. The librarian's quarter is dark, and should have a window at one side.

The guard-room is under the gateway. It consists of two divisions, one within the other. The inner room has a fire-place, but not the outer room. It requires ventilation by a shaft. Adjoining the guard-room is a row of cells, reached by a passage open above to the outer air. There is no provision for warming these cells. The passage should be roofed over, a stove properly supplied with fresh air should be provided, and the fresh air warmed by the stove should be admitted to the cells and guard-room by suitable openings. A drain passes under the lock-up room. It ought to be abolished, as it is dangerous in such a situation. Besides the guard-room cells, there are two good cells belonging to the provost establishment, which appear to be sufficiently warmed and ventilated.

The quarters of the barrack serjeant are in a one-story cottage built close to the rampart wall. The back room of the cottage is dark, and without means of ventilation, and it is not healthy. It requires a window through the back wall, which could easily be made.

Carlisle Castle is deficient in day-rooms, drill shed, workshops, and married soldiers' quarters.

At present the tailors' and shoemakers' shops are in the basement of B. range. They are dark and damp, and very unfit for their purpose.

There are no staff serjeants' quarters and no proper serjeants' mess.

*The following are the Improvements required for Carlisle Castle Barracks:—*

1. Reduction of the numbers of men in each room to the extent stated.

2. Ventilation of each barrack-room in ranges B. and E. by shafts, inlets, and remodelled grates. Staircases in these ranges to be ventilated by a shaft through the ceiling and by perforated panes in the windows. An additional window to the back to be opened in the staircases of range B.

Ventilation of the rooms in ranges A. and G. by shafts and inlets, if possible, or, if not possible, by Arnott's ventilators and perforated zinc panes. Ventilation of the rooms in range K. by Arnott's silk flap ventilators into the chimneys, perforated glass or zinc panes in the windows, and remodelled grates. Ventilation of the school-room by a shaft and inlet. Ventilation of the guard-room by a shaft. Improving the ventilation and warming of the cells as described.

All non-commissioned officers' rooms to be ventilated by Arnott's ventilators. Barrack serjeants' house to have a window at the back. Canteen tap-room and non-commissioned officers' room to be ventilated by Arnott's ventilators and perforated glass panes in the windows.

3. Ventilated gas-burners to be introduced into all the barrack-rooms.

4. Ablution-rooms to be improved by being ventilated through the roof, and having gratings, pegs, and beads to the ablution tables provided.

5. Two baths with water laid on are to be provided.

6. Women's wash-house to be improved by ventilation through the roof, and to have fixed tubs, gratings, and a drying and laundry stove.

7. Cook-house to have additional light admitted.

8. Drainage of the parade ground to be improved. Privies to be entirely reconstructed as water latrines on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation, and to be properly drained. Canteen privy to be reconstructed as a water latrine, properly drained. Proper urinals to be provided.

Ashpit at the soldiers' privies to be abolished, and an iron cart for daily removal of the refuse to be substituted.

Lastly, legal steps ought to be taken to suppress the smoke nuisance complained of.

*Carlisle Castle Hospital.*

This is one of the worst army hospitals we have inspected. It was originally the dwelling of the Lieut.-Governor of the castle, and is not only a bad specimen of house architecture, but not having been intended for a hospital, it is unadapted for such a purpose. We think, nevertheless, that by additions and improvements, it may be made to answer its object within certain limits.

The house is situated at the upper end of the parade ground, towards which it faces, without any enclosing wall, and it is built so close to the high rampart behind that there is only a small narrow court behind, into which are crowded the hospital kitchen, dead-house, privies, &c.

The building is three stories high. On the ground floor are placed the surgery and serjeants' room; over these are a flat of wards; and over these again are low attics, one of which is intended as an itch ward.

There is another ward in a lean-to built against one end of the house, but this ward has its floor below the level of the ground.

There are altogether four wards and 20 beds, and the following table will give an idea of the amount of overcrowding which at present exists in the wards:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 - - | 8 | 3 | 5 |
| 2 - - | 5 | 1 | 4 |
| 3 - - | 5 | 1 | 4 |
| 4 - - | 2 | — | 2 |
| Total - - | 20 | 5 | 15 |

If the cubic space in all the wards were thrown together and divided by 1,200, there would be room in the building for seven beds, instead of 20; but if the rooms are to be taken one by one, ward No. 1 cannot hold four beds, wards Nos. 2 and 3 cannot hold two beds each, and ward No 4. is quite unfit for occupation, and should be struck off the construction at once.

There is space, therefore, for five beds in the building.

The present amount of space per bed is from 391 to less than 500 cubic feet, and exhibits the largest extent of overcrowding we have met with.

Notwithstanding this great overcrowding, there are no means of ventilation, and some of the windows do not open at top. We would propose to remedy this defect as follows: A window should be broken through the back wall of each of the first-floor wards. Each ward should have a shaft and inlet, and the staircase should have a louvre through the roof and perforated glass panes in the windows.

A ventilated gas-burner should also be introduced into each ward.

The following are the present deficiencies of accommodation in the hospital:—There is no accommodation for orderlies. There are no means of washing or bathing sick or convalescents. There is no wash-house. The kitchen is imperfectly supplied with the means of cooking. There is no watercloset connected with the wards; but there is a water latrine in the back yard. There is no provision store and no pack store.

The only way to improve this hospital is to extend it, and it can be done. At one end of the present building there is a large area of ground used as a barrack drying ground. This ground could be quite well used for the erection of two or three good wards, and in connexion with them the deficiencies we have pointed out might be provided for.

*Our Recommendations, then, for Carlisle Castle Hospital are as follow:—*

1. To extend the hospital so as to afford the required per-centage of sick accommodation at 1,200 cubic feet per bed, with ablution and bath room, watercloset, &c.; and until this is done, to make temporary provision for the sick by a hospital hut or otherwise.

2. To open windows in the back walls of the present wards, to make all windows open at top, and to ventilate the wards and staircases by shafts and inlets as described.

JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

*To the Secretary of State for War.*

Barrack and Hospital Improvement Commission,
August 12, 1859.

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# NORTH BRITISH DISTRICT.

SIR,

HAVING completed our inspections and inquiries with regard to the barracks and hospitals in the North British district, we have now the honour to report the results. We have inspected the following barracks in this district:—

| | | |
|---|---|---|
| I. | Edinburgh | 1. The Castle, Infantry. |
| | „ | 2. Piershill, Cavalry. |
| | „ | 3. Leith Fort, Artillery. |
| II. | Berwick-on-Tweed | Infantry. |
| III. | Stirling | The Castle, Infantry. |
| IV. | Glasgow | 1. Infantry. |
| | „ | 2. Recruiting. |
| V. | Ayr | Infantry. |
| VI. | Paisley | Infantry. |
| VII. | Hamilton | Cavalry and Infantry. |
| VIII. | Dumbarton Castle | Artillery. |
| IX. | Fort Augustus | Infantry. |
| X. | Aberdeen | 1. Infantry. |
| | „ | 2. New Fort. |
| XI. | Dundee | Infantry. |
| XII. | Perth | 1. Infantry. |
| | „ | 2. Victoria Street. |
| XIII. | Fort George | Infantry and Artillery. |

We shall report on each barrack and hospital separately.

## I.—EDINBURGH.

### 1. EDINBURGH CASTLE.

The buildings of Edinburgh Castle cover an irregularly shaped area 11 acres in extent on the summit and slopes of the Castle rock, at an elevation of from 350 to 431 feet above the level of the sea. They consist of structures of different eras; some are of great antiquity and others are of recent erection.

The more ancient buildings are the palace, part of which is used for the canteen and for soldiers' quarters, and the Parliament Hall, now appropriated as a hospital.

The more recent buildings are a large block of barracks erected at the end of last century, the governor's house, ordnance stores, &c., and the expense magazine, recently converted into a temporary barrack on the dismantling of a large old barrack which adjoins the palace.

The older buildings are arranged in square. The newer ones are in line. The whole are freely exposed to the high winds which blow over this elevated part of the city, and any external stagnation of air is impossible. The situation is an exposed though a healthy one, but the barracks themselves are not amongst the most healthy in Scotland. The mortality in them during the last five years has been 14 per 1,000 per annum; a death-rate considerably above the army average for Scotland for the same five years, which has been 9·3 per 1,000, and much greater than in the other barracks in the city and neighbourhood. The facts in the following table of mortality for five years ending 1858–59 have been furnished to us by the principal medical officer on the station:—

| Years 1854 to 1859. | Average Strength. | Total Deaths. | Annual Ratio of Mortality per 1,000 Strength. | Deaths from Consumption and other Chest Diseases. | Deaths from Fever and Eruptive Fevers. |
|---|---|---|---|---|---|
| Edinburgh Castle, Infantry | 698 | 50 | 14 | 22 | 13 |
| Piershill, Cavalry | 488 | 12 | 5 | 6 | 1 |
| Leith, Foot Artillery | 232 | 5 | 4⅓ | 1 | 2 |

Of the 50 deaths occurring in Edinburgh Castle during the period 13 deaths took place from phthisis, and 13 from fevers and eruptive fevers. Six of the latter deaths were from small-pox.

The annual mortality from chest diseases and fevers has in Edinburgh Castle been in the ratio of 10 per 1,000 strength. At Piershill barracks, about two miles distant, it has been under 3 per 1,000, and at Leith Fort about 2½ per 1,000 strength.

The mortality in different corps is to a certain extent influenced by their constitution and by the greater or less activity in invaliding, but making

every allowance for these disturbing causes, there is a sufficiently large balance of mortality against Edinburgh Castle to lead to the inquiry how it happens that so considerable an amount of consumption and fever occurs in buildings occupying one of the most airy and healthy sites in the country.

To what extent this result, and the almost constant recurrence of small-pox among the troops, may be attributable to the defective construction, want of ventilation, and overcrowding of the barracks we shall presently see.

The greater part of the troops are in the *New Barrack*. This is a large block of building situated on a ledge cut out of the basaltic rock. It faces east and west. On the west side the buildings are seven stories high. On the east side the rock is only a few feet from the back windows of several of the lower flats from which it is divided by a narrow area.

The entrance to this large barrack is by a double passage about half way up in the east front of the building, from which the barrack-rooms are reached by ascending and descending the stairs.

There are 53 barrack-rooms in the building, arranged in a similar manner to that adopted in many cavalry barracks. A long dark corridor branches right and left from the central stairs, and the barrack-rooms are entered right and left from the corridor. But there is one very important difference in the arrangements, that, whereas, in cavalry barracks the corridors have generally large windows to the open air at the ends, those in this barrack are closed at the ends by officers' quarters, which occupy the extremities of the block.

The barrack-rooms have only one window each to the open air, and a small window to the corridor for affording some light to the latter. Forty-five of the rooms are 18 feet long, 17 feet broad, and 10 feet high. The remaining rooms are 8 feet high.

Considering the purpose which the building is intended to serve, this new barrack is a very unfavourable specimen of barrack architecture and arrangement. The structure is complicated. The rooms of the various stories are all connected together by gloomy passages and corridors. The proportion of window space is very small, and the means of ventilation afforded by the construction are quite inadequate for the number of inmates.

The overcrowding throughout the building is excessive. It contains 447 men under one roof. One room capable of holding 6 men gives the largest amount of space per man in the building, and that is only 302 cubic feet. One 12-men room exhibits the most excessive degree of overcrowding we have anywhere met with. In this instance the space returned to us by the barrack-master is only 181 cubic feet per man. The remaining rooms afford an amount of space varying between these two extremes.

The following table shows the total present accommodation in the *New Barracks*, in contrast with what it would be at 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 1 | 12 | 6 | 6 |
| 2 | 12 | 6 | 6 |
| 5 | 12 | 6 | 6 |
| 6 | 12 | 6 | 6 |
| 7 | 12 | 6 | 6 |
| 15 | 12 | 4 | 8 |
| 13 | 6 | 5 | 1 |
| 18 | 9 | 6 | 3 |
| 45 8-men Rooms | 360 | 225 | 135 |
| Total 53 | 447 | 270 | 177 |

These rooms ought not to contain more than 270 men, and 177 men will require to be accommodated elsewhere. The numbers in the 12, 6, and 9-men rooms will have to be reduced to the extent shown in the table, and the numbers in the 45 eight-men rooms will have to be reduced to 5 men per room. The remaining men will have less than 600 cubic feet per man ; but considering the airy position of the barrack, and taking into account the improvements we are about to suggest in the building, we are of opinion that the numbers per room given above may be safely accommodated in them.

But while we concede this much as regards the question of cubic space, we must, at the same time, state that the attics and basement of these barracks are hardly fit for occupation. The former have their entrance from the top of the barrack staircase, and receive the foul air from the unventilated flats below. The basements are arched, and several of them were occupied by married people when we were there. The basement rooms behind and nearest the rock have no direct communication with the external air. Several of the basement rooms had the windows entirely open, but they nevertheless smelt abominably, and they cannot be healthy. Small-pox has prevailed among the children in these basements.

They are, at all events, not fit to be inhabited by a number of human beings. In other words, they are not fit for barrack-rooms.

The rooms in the second flat on the eastern side are so gloomy from the wall rising in front of them, that the men can scarcely see to dress, and the stairs leading to them are so dark that it is necessary to keep lights in them to prevent accidents.

In case of emergency rooms of this description would of course have to be occupied ; but surely at all ordinary times such places should be struck off the construction of barracks. If all the rooms which it is unadvisable to occupy were thus struck off, and a sufficiency of cubic space given in the remaining rooms, there would only be a small amount of really good barrack accommodation in the Castle.

No part of the building is ventilated. We thus have the three elements of bad construction, overcrowding, and defective ventilation all bearing against the health of the inmates, who, if they have not suffered more than they have done from zymotic and pulmonary diseases, owe it more to the healthy local position of the barrack than to its construction and internal arrangements.

The first thing to be done with this building is to improve its ventilation, beginning with the corridors and stairs. Were it at all practicable we would recommend the line of the corridors to be carried from end to end of the block, so as to open directly to the external air by windows of the same breadth and height as the corridor. To do this, however, it would be necessary to carry the corridor right through the middle of the officers' quarters, and it would be necessary in all probability to remove the officers' quarters out of the block, and rebuild them elsewhere ; but in doing this some of the additional space, so much required for the men, would be obtained, and the whole block would be very much improved in its sanitary state.

Next, it will be necessary to have a free circulation of air up the centre of the building by a series of large gratings placed at intervals in the floors of the corridor one over the other from the lower story to the roof, and to place large louvres in the roof to admit of free egress for the foul air from below. One of these louvres ought to be placed at the top of the staircases, and all the staircase windows ought to have perforated glass panes in the upper row of the window sashes.

Each room should be ventilated separately, and should have a foul-air shaft carried from the corner of the ceiling to above the roof, and an inlet from the outer air placed close to the ceiling.

All the fire-grates should be remodelled to warm

part of the admitted air. At present these grates are very wasteful of heat and fuel.

*The Old Barracks* are on the summit of the castle rock. They are arranged in square. One side of the square is formed by the Old Palace, part of which is now occupied as men's rooms, and the canteen.

On the adjoining side of the square is the old Parliament Hall, now used as a hospital. The next side of the square consists of old buildings adapted for barrack-rooms ; and the fourth side is completed by a building which was formerly divided into soldiers' rooms, but which has recently been dismantled in connexion with the contemplated improvements in the Castle.

The following table shows the existing accommodation in the *Old Barracks* :—

| Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 1 | 12 | 12 | — |
| 10 | 12 | 8 | 4 |
| 12 | 12 | 6 | 6 |
| 3 | 16 | 14 | 2 |
| 5 | 16 | 9 | 7 |
| 2 | 18 | 14 | 4 |
| 9 | 18 | 11 | 7 |
| 4 | 10 | 7 | 3 |
| 6 | 7 | 4 | 3 |
| 7 | 7 | 4 | 3 |
| 11 | 6 | 4 | 2 |
| Total | 134 | 93 | 41 |

The old barracks will accommodate 93 men at less than 600 cubic feet per man ; and we are of opinion that no more than the number specified above ought to be placed in each room.

The barrack-rooms vary in structure. Five of them are only eight feet high, three are nine feet high, and three are 12 feet high. Some are gloomy ; all are unventilated ; and several of the rooms are shored up on account of their dilapidated condition.

One or two of the rooms have two chimney flues. One of these should be converted into a foul-air shaft, by making an opening into it close to the ceiling and closing the fire-place below.

The rooms in the Old Palace should have shafts carried up through the roof, and inlets for fresh air might be provided over the doors.

The external walls are very thick, and it would be unadvisable to make openings in them.

In the buildings on the west side of the square foul-air shafts should be carried from the corners of the rooms which have not two fire-places, and inlets might be sufficiently provided for these rooms by remodelling the grates.

The school-rooms, serjeants' mess, and workshops should also be ventilated in a similar manner.

The barrack accommodation in the expense magazine consists of eight long narrow rooms with shed roofs. They are entered from a central passage, and have one window at the end opposite the door, but they have light and ventilation through the roof. These rooms are so narrow that there is a breadth of 18 inches only from foot to foot of the opposite beds. They accommodate at present 16 men each, at 439 cubic feet per man, or 128 men in all. These rooms are considerably overcrowded, and several cases of small-pox have occurred among the men occupying them. As they are only intended for temporary occupation, it is not necessary to make any recommendations regarding them.

There are several men's rooms in Edinburgh Castle with flagged floors. These floors ought all to be boarded.

The ablution accommodation is as follows :—In the new barracks it consists of four narrow rooms, made out of passages in the different floors of the barracks. One of these rooms is almost dark. They have slate tables and gratings, but they require pegs for hanging clothes on, and the tables are not all supplied with beads to prevent the water dashing over on the men. Several baths have been put up, which are separated from each other by curtains.

We have several times objected to dark and unventilated ablution-rooms being placed within buildings where men live and sleep, on account of the additional dampness of the air arising from so large an extent of constantly wet surface being exposed.

When the new barracks were constructed ablution accommodation does not appear to have been provided in the plan, and the present arrangement is perhaps the only one which could have been adopted in such a building.

Ablution and bath rooms should have a ventilation quite independent of that of the barracks, and this should be kept in view in any alterations in the structure of these buildings.

The ablution-room belonging to the old barrack is in the back yard. It is a good room and sufficiently lighted. The table requires a bead, and pegs should be put up for hanging the men's clothes on while washing. One bath should be provided for this barrack.

A third ablution-room has been provided for the barrack sheds. It requires pegs and a form. Attached to this room is a water urinal on the principle of the one put up in Wellington barracks, and is stated to answer very well.

There are two cook-houses, one for the new barrack and one for the old barrack. The boiler accommodation is sufficient for the strength ; but there are no means of baking or roasting meat.

The cook-houses belonging to both barracks are tolerably good, but both require roasting ovens.

The latrines are drained down the side of the rock to the town sewers. They are of the ordinary form, and are simply washed out by the ablution-room water passing through them. They require reconstruction on Macfarlane's principle, with receptacles in which water will stand. They should have divisions of seats, half-doors, light, and ventilation.

The drains connected with the latrines ought all to be ventilated at a sufficient distance down the rock to prevent effluvia reaching the barracks, otherwise these long steep drains are apt to become ventilating shafts for the town sewers.

Urinals of a non-porous material, properly supplied with water for cleansing, should at the same time be substituted for those at present in use.

The Castle is abundantly supplied with water from the Edinburgh Water Company's works.

Some improvement in the ashpits and in the removal of barrack refuse is required.

There is so small an area available within the walls that it would be advisable, if possible, to provide for the daily removal of all ashes, dust, &c. in the same way as is done in Edinburgh. An iron cart might be placed in a convenient position for the purpose, or if this be not practicable, the ashpits should be provided with hoppers on Macfarlane's principle. It should be kept in view, however, that it is both the cleanliest and safest plan to remove all refuse as soon as possible out of circumscribed spaces where many men live together.

There is no proper laundry for the use of the garrison ; but only an ordinary women's wash-house in the basement of the new barracks. It has no suitable conveniences for washing, and should be provided with fixed tubs, and water laid on to them, and a proper drying stove.

There are two guard-rooms, one at the barrier and the other is the main guard. The latter is about to undergo alterations. The former requires ventilation through the roof, and a remodelled grate. The chimney of the officer's room is complained of on account of its smoking.

There is a good provost establishment of 12 cells, each of which gives upwards of 900 cubic feet per man. The cells are ventilated and warmed on Colonel Jebb's plan. There is an ashpit close to these cells which ought to be entirely removed.

The canteen is in the ground floor of the old palace, and occupies a large amount of space which might possibly be turned to better account.

The tap-room and non-commissioned officers' rooms are dark, and require ventilation by perforated glass panes in the windows.

Properly speaking, there are no married soldiers' quarters within the Castle, but a number of families are accommodated in the basement rooms of the "New Barracks." We have already stated our objections to these rooms on account of their unhealthiness, and we may further add that his Grace the Duke of Richmond, who takes great interest in the soldier's welfare, put into our hands a copy of a letter addressed by him, on the 1st December 1858, to the Assistant Adjutant General with reference to certain improvements required for the hospital, and along with it his grace gave us a paper containing notes, of which the following is a copy. We insert it here because it pointedly calls attention to the results of the want of proper married quarters in causing disease, to the want of proper hospital accommodation for soldiers' wives and children, and to the privations consequent thereon, after disease has arisen from defects in the married accommodation :—

"I beg to call the attention of the Commissioners to a copy of my letter to Viscount Melville, dated the 1st December 1858.

"The head-quarters of the city of Edinburgh Artillery Militia, and the head-quarters of the Royal Sussex Light Infantry Militia, are now in the Castle of Edinburgh.

"There is no room where the men's shirts, socks, &c., can be dried, and it is contrary to order that they should be dried in the sleeping-rooms. In the workhouses and prisons in England 'drying-rooms' are furnished.

"There are no available rooms to remove 'infectious' cases, either in the hospital or in the barracks.

"A case in point is submitted. In a married room, which contained three men, their wives, and four children, one child three weeks old was attacked by small-pox. I was obliged to hire lodgings for the men, their wives and children, in the town at my own expense. The mother of the child caught the small-pox ; and, since, one of the children.

"If married men and their families are to be permitted to be in barracks, surely there ought to be accommodation for them when attacked by an infectious disease.

"The medical officer cannot order medical comforts to the women and children. A soldier cannot support a wife unless she washes for the company. She is taken ill, or obliged to nurse her sick children, and her means of support are gone, and when sick she can only have such nourishment as is necessary for her recovery by the charity of the officers."

The latter of these contingencies will be obviated in future by the new hospital regulations, in all cases where hospital accommodation is provided for the sick of soldiers' families, but unless such provision can be made in Edinburgh Castle by an extension of the hospital, the evils pointed out by his grace will continue in operation as at present.

We have been informed that plans have been prepared for extending the buildings of Edinburgh Castle, and while we were there preparatory works of demolition had been commenced.

It appears to us to be of the utmost importance to consider these plans with reference to the sanitary defects and to the deficiency of accommodation we have pointed out.

Excluding for the present the barrack accommodation which has been destroyed to make room for a contemplated chapel school, and which has been temporarily supplied in the sheds of the expense magazine, the total accommodation in all the barrack rooms, some of which are not fit for permanent occupation, is only sufficient for 360 men instead of for 581 men, the number on the present construction.

The major question then appears to us to be that of providing a sufficiency of wholesome barrack accommodation for the number of men which, on military grounds, it may be considered necessary to keep in garrison, with a proper proportion of married quarters, either within or without the walls ; and this question we would specially recommend for consideration with reference to the proposed plans. As we shall presently show, the question likewise includes hospital accommodation. The sanitary improvement of the existing buildings would also be best considered at the same time, for it is possible that some of the requirements, as, for instance, the ventilation, might be carried out more economically when other works were being proceeded with.

*The Improvements requisite for the present Buildings are as follow :—*

1. Reduction of the number of inmates in all the barrack rooms to the extent shown in the preceding tables.

2. Ventilation and lighting of the staircases and corridors of the "new barrack," by gratings in the floors of the corridors, windows at the ends, louvres in the roof, and perforated glass panes.

3. Ventilation and warming of all the barrack rooms, school-rooms, serjeants' mess, and workshops, by shafts and remodelled grates ; barrack-rooms in the "new barracks" to be provided with inlets near the ceiling ; ventilation of the barrier guard-room, the fire-grates to be remodelled to warm the air and to prevent smoke ; canteen to have perforated glass panes in the windows.

4. Ablution-rooms to have beads to the tables, and pegs. One bath to be provided for the old barrack.

5. Cook-houses to be provided with means for baking and roasting meat.

6. Privies to be reconstructed as water latrines on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation. The drains leading from them to be ventilated. Improved urinals with water laid on to be provided.

7. Ashpits, if possible, to be entirely removed, and the barrack refuse to be taken away daily. Otherwise the ashpits to be covered and provided with hoppers. Ashpit near the provost cells to be entirely removed.

8. Women's wash-house to be provided with fixed tubs, and water laid on, and a drying and laundry stove.

*Edinburgh Castle Hospital.*

The garrison hospital forms the south side of the Palace square, and occupies the old Parliament House, which has been divided by floors, partitions, and stairs to afford the present accommodation, consisting of four wards affording regulation space for 62 beds, with from 660 to 704 cubic feet per bed.

The ground floor is occupied by the entrance hall and passage, out of which there is access by passages right and left to the principal medical officer's office, the surgery, nurse's room, pack store, kitchen, serjeants' quarters, and dead-house.

A good, roomy, light staircase gives access to the wards above, which occupy the two upper flats of the building.

The wards are all of the same dimensions,—namely, 33 feet long, 32 feet wide, and 10 feet high, and they have two and three windows on each of their opposite sides. Half of the windows open into the courtyard, and the other half open to the free atmosphere over the precipitous cliff on the edge of which the hospital is situated. The wards have the appearance of being low-roofed, because their height is too small for their other dimensions.

The following table shows the present accommoda-

tion in comparison with what it would be at 1,200 cubic feet per bed :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| B. 3 | 16 | 10 | 6 |
| A. 3 | 16 | 10 | 6 |
| A. 4 | 15 | 10 | 5 |
| B. 4 | 15 | 10 | 5 |
| Total - | 62 | 40 | 22 |

Each ward at a little less than 1,200 feet per bed would hold 9 beds. With 10 beds the space amounts to 1,056 cubic feet per bed. One entire face of the hospital is exposed to high winds, and as there are windows on opposite sides of the wards, each ward might, perhaps, accommodate 10 beds until additional space could be provided, but certainly no more.

There would thus be space for 40 beds, but more accommodation might be obtained by removing the recruiting duty out of the building.

At present there is no sleeping space for orderlies, except in the wards.

Some provision has been made for ventilation by hollow beams and by louvres in the windows, but it is not sufficient. A shaft is required besides. It should be carried up from one corner of each ward to above the roof. The existing hollow beam and louvres would then act as inlets.

The rooms are warmed by fire-grates or stoves. It would be advantageous in so exposed a situation to make arrangements for warming part of the air admitted in winter by remodelling the grates.

Until recently there was no fixed bath in the hospital, but in consequence of a representation from his Grace the Duke of Richmond, a proper bath has been fitted up in a room at the top of the stair. There is no ablution accommodation, but there is space in the bath-room for a few of Macfarlane's wash-hand basins, which would afford the required facilities.

There is no hospital laundry, and there is no space for one.

On account of a representation also made by his grace, an oven has recently been put up in the kitchen. As the kitchen is under a ward, it will be necessary to carry up a shaft, about a foot square, from the corner of the ceiling to above the roof.

The water supply is good and sufficient. There are good waterclosets out of the landing, with cross windows to insure ventilation.

This hospital is deficient in many important requirements.

It has no provision store. The pack store is insufficient. The bedding store is bad. There is neither exercising ground nor day-room for convalescents, who are hence confined to the sick wards all the time they are in hospital.

The kitchen is too small, and the orderlies have to clean knives, &c., in the dead-house, which is under the hospital, and not detached from it, as it ought to be. There is no accommodation for the sick of soldiers' families, especially for small-pox cases, which are of frequent occurrence in the overcrowded barracks where soldiers' families live.

The great difficulty is to find the requisite space for the accommodation required. It certainly cannot be supplied by the present building, which is not sufficiently large, even if the administrative offices were removed out of it, to accommodate properly the ordinary proportion of sick.

As already stated, we would strongly recommend that the question of hospital accommodation should be considered at the same time as the extension of the barrack accommodation with a view to their being properly balanced, to meet the requirements of the force of the garrison.

*In the meantime we would recommend that the following Improvements be carried out :—*

1. Reduction of the number of beds in each ward to ten.

2. Ventilation and warming of each ward by a shaft and remodelled grate. Ventilation of the kitchen by a shaft.

3. A Macfarlane's ablution-table to be placed in the bath-room.

### 2. Piershill Cavalry Barracks.

These barracks are situated about a mile to the east of Edinburgh and about a mile from the sea at Portobello. The site is naturally a low one when compared with the neighbouring ground, but there is sufficient fall for drainage. There is a small village contiguous to the boundary wall, but with this exception the situation is open, airy, and exposed to the sea breeze, a circumstance which tends materially to diminish or to counteract other disadvantages in the site presently to be noticed. There are several nuisances in the vicinity of the barracks which in our opinion might be easily abated or removed, and which we consider ought to be dealt with summarily.

The worst of these is a small gas-work belonging to the North British Railway, close to the boundary wall. The nuisance from this source is not greater than usually proceeds from gas-works, but as it is quite possible to conduct the manufacture of gas without injury to anyone, the proprietors ought to be compelled to do so.

Extending from the barracks towards the sea there are between 200 and 300 acres of meadow land under irrigation from the sewage of the old town of Edinburgh. There has been complaint of nuisance from these meadows from time to time, but as the property is a very valuable one, letting from 20*l.* to 30*l.* per acre per annum, any interference with it has been successfully resisted. These complaints have given rise to several inquiries into the source of the nuisance, and they were dealt with by a Royal Commission, appointed in January 1857, to report on the whole subject of the application of town sewage to economical purposes.

The following extract from the preliminary report of that commission gives the result of their examination into this special case :—

"There is one circumstance, however, in the case of the Edinburgh meadows which is invariably brought forward as an objection by the opponents of sewage manure, namely, that they give rise to constant complaints, not only from persons living in the immediate neighbourhood, but from inhabitants of some parts of Edinburgh itself at a distance of two miles. There can be no doubt that in their actual condition they would be a source of nuisance, especially in hot weather; but we feel satisfied from inspection that this evil is not a necessary concomitant of sewage application, even in the large quantities employed at Edinburgh, but that it arises from the existence of open ditches which convey the sewage, and on whose banks solid offensive matter is deposited and exposed to the air. The absorption of the offensive gases of sewage by the soil and by vegetation is so rapid that there is no perceptible smell from meadows after irrigation, and it is manifest that if closed drains or pipes were substituted for open ditches the inhabitants of Edinburgh would cease to have cause to complain of this employment of the sewage."

We [illegible] these meadows in the vicinity of Piershill barracks, and we [illegible] that the [illegible] from the [illegible] there [illegible] nuisance [illegible] from the occupation of the meadows, [illegible] serious [illegible] of removal.

The [illegible] immediately outside the [illegible] boundary is occupied by large open [illegible] receiving deposits which, at an ordinary

temperatures, give off offensive emanations. These sewers could all be arched over without in any way interfering with the irrigation, and were this done most of the nuisance would disappear.

We were informed that the lessee or proprietor had expressed his willingness to do everything in his power to remove any cause of complaint; and we would recommend that he be requested to cover over the main watercourses to a sufficient distance from the barrack to prevent nuisance from them reaching the barracks.

At the same time we must express our opinion that barracks should not, if possible, be placed in such situations. Their healthiness or unhealthiness depends on too many contingencies as to temperature, moisture, &c. to render their occupation desirable.

In regard to the barrack itself, it is situated within a rectangular enclosure eight acres in area, fronting the public road between Edinburgh and Portobello. The buildings are in three ranges, enclosing a parade ground. The centre range contains officers' quarters, with men's quarters at the ends, and the two side ranges have men's quarters. The buildings are in two floors. The stables are below, and the men's rooms are on the floor above.

Behind the men's ranges are the riding school, workshops, hospital, &c., and on the side fronting the public road are the gates, guard-room, cells, &c.

The total accommodation is for 354 non-commissioned officers and men.

The men's accommodation consists of 37 eight-men rooms, all of a size. They are 27 feet long, 16 feet broad, and 9 feet high, and are arranged in the usual manner of cavalry barracks, namely, along two sides of a central passage or corridor extending from end to end of the block, and these corridors are reached by good stone stairs between the stables. The average space per man is 485 cubic feet. The following table shows the total present regulation accommodation, and what the accommodation would be at as nearly as possible 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 37 | 296 | 259 | 37 |

As already mentioned, the present number of men per room is eight. If six were allotted to each the amount of space, although above 600 cubic feet per man, would not be greater than it already is in certain cavalry barracks. If the number of men per room were reduced to seven the amount of space would be under 600 cubic feet. We should prefer in this barrack, were it practicable, that the numbers of men per room were fixed at six instead of seven; but in the preceding table we have adopted seven men as the maximum nearest that required by our instructions.

The corridor leading to the barrack-rooms has been sufficiently lighted and ventilated by three ventilating shafts, with lights over them, carried up from the ceiling through the roof. These shafts resemble those we have recommended for other cavalry barracks.

The men's rooms have the doors close to the fireplace, which is a defective arrangement wherever it exists, because it makes the fireside uncomfortable, and prevents the due ventilation of the opposite end of the room. In this and in all similar cases we would advise the removal of the door to the end of the room opposite the fire.

The rooms have openings in the ceiling, said to be connected with air shafts carried through the roof. Hence it will only be necessary to complete the ventilating arrangements by providing one inlet of the usual form in the outer wall of each room close to the ceiling. The fire-grates should at the same time be remodelled to warm part of the air admitted in winter.

All the rooms have too little window space. They have each one window 4 feet high by 9 feet wide near the fire-place, an arrangement which leaves a large part of the room in comparative darkness. To remedy this we would recommend an additional window to be opened in each room at the end farthest from the fire-place. It would also improve the ventilation of the whole building if the windows between the rooms and passages were made to slide, and if perforated glass panes were put into them.

The stables being under men's rooms should be ventilated by shafts carried from the corners above the roof. They have inlets at present. The pavement in some of the stables is far from being good.

There are some temporary stables which might be materially improved by increasing their ventilation through the roof. There are no litter sheds.

Each of the serjeants' rooms requires an Arnott's silk flap ventilator in the chimney.

The serjeants' mess and the library should be ventilated like the barrack-rooms.

The school-room has two fire-places, one of which should be closed, and the chimney shaft converted into a foul-air shaft by an opening double its sectional area being made into it close to the ceiling. It also requires two inlets for fresh air, and a remodelled grate of the usual form. This school-room is stated to be much too small for the requirements of the barracks.

There are projecting buildings behind the entrance passages, in which are placed the ablution-rooms and cook-houses. There are two ablution-rooms, with benches, &c., and in one of them a bath with hot and cold water had been recently put up. There were no ledges to the tables, and no pegs, and no forms at the time we were there, but the improvements in the rooms were not completed. Ledges, pegs, and forms should be provided if they have not been so already. Three baths would be required for the strength in barracks.

The cook-houses have boilers of the usual form, and a brick oven for baking the dinners had just been put up in one of them.

The women's wash-house is too dark, and it has not sufficient ventilation. It requires a skylight and louvre, and it should be properly fitted up with fixed tubs having water laid on. It should have a laundry and drying stove.

Some new workshops have been recently erected, but like others in the barrack they require to be ventilated. We would propose to effect this by placing Arnott's ventilators in all the chimneys, and perforated panes in the windows.

There are four latrines, drained and trapped, but one set only were provided with proper water receptacles on Macfarlane's principle. These water latrines should be introduced in every case; all the latrine buildings should be properly lighted and ventilated, and, whenever practicable, divisions, with half-doors, should be put up.

There are slate urinals, but they are not of very good construction, and are difficult to keep clean.

The ashpits and manure heaps are excavated instead of being above the level of the ground. In so open a situation it is not necessary to provide iron carts, but both sets of receptacles should be filled up a little above the level of the ground. They should be paved and drained, and the ashpits should be covered and provided with hoppers on Macfarlane's principle.

A sufficient water supply is provided from a reservoir on Arthur's Seat, and all the drains are stated to be trapped. The stable drainage is, however, defective, and requires improvement.

The riding school is rather dark and would be

improved by additional light and ventilation through the roof.

The canteen accommodation is not sufficient, as there is no proper dwelling house for the tenant. An Arnott's ventilator and perforated panes are required for the tap-room.

There are 22 sleeping rooms for non-commissioned officers, but there is no accommodation for married soldiers. None of these rooms are ventilated.

There is no chapel.

The guard-room is very small for the number of men. It requires ventilation by a shaft through the roof and a remodelled grate. Additional ventilation should also be given to the lock-up by an opening through the roof.

*The following is a Summary of the Sanitary Improvements required for Piershill Barracks:—*

1. Steps to be taken for having the open sewers in the vicinity of the barracks covered, and the nuisance from the gasworks abated.

2. Reducing the regulation number of men from 8 to 7 per room.

3. Completing the lighting, ventilation, and warming of the men's rooms by opening an additional window to the external air in each room, and making the windows into the passages to open by sliding.

Providing an inlet for fresh air through the outer wall of each room close to the ceiling, and remodelling the fire-grates to warm part of the admitted air in winter. The room doors to be moved to the end farthest from the fire.

All the non-commissioned officers' rooms to be provided with Arnott's valves into the chimneys.

The serjeant's mess and the library to be ventilated by shafts and inlets.

The school-room to be ventilated by converting one of the chimney flues into a ventilating shaft, as suggested, and by two inlets for air and a remodelled grate.

The new workshops and the canteen tap-room to be ventilated by Arnott's ventilators and perforated panes.

Guard-room and lock-up to be ventilated through the roof. Guard-room to have a remodelled grate.

4. Stables to have shafts carried from the corners the ceiling above the roof. Their surface drainage to be improved. Temporary stables to have additional ventilation through the roof. Riding school to have sufficient light and ventilation through the roof.

5. Ablution tables to have ledges. Pegs and forms to be put in the ablution-rooms, and the number of baths to be increased to three.

6. Women's wash-house to be provided with fixed tubs and water laid on, also with a laundry and drying stove, and to have light and ventilation through the roof.

7. All the latrines to be reconstructed on Macfarlane's principle; if practicable, with larger divisions of seats and half-doors. The buildings to be suitably lighted and ventilated.

8. Ashpits and manure heaps to be filled up above the level, and to be paved and drained. Ashpits to be covered and provided with hoppers.

### *Piershill Barrack Hospital.*

This hospital is situated on the east side of the barrack enclosure, and has a small court-yard behind. It is two stories high, and contains on the ground floor the surgery, bath-room, and kitchen on one side of the entrance, and a ward on the other side. On the upper flat is a ward the same size as the one below, and over the kitchen and bath-room are two small wards. The total regulation accommodation is for 32 beds, 28 of which have 701 cubic feet per bed. The following table shows the accommodation:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 14 | 8 | 6 |
| 2 | 14 | 8 | 6 |
| 3 | 2 | 1 | 1 |
| 4 | 2 | 1 | 1 |
| Total - | 32 | 18 | 14 |

In the two larger wards the amount of space we have allotted for the eight beds in the table is 1,227 cubic feet per bed, but in case of emergency nine beds instead of eight might be accommodated. This would give about 1,100 cubic feet per bed. The two smaller wards ought not to have more than one bed in each.

The larger wards have inlets for air near the ceiling, four on each side, and they have three windows on each side. They have two fire-places, the chimney of one of which might be made to serve as an outlet foul-air shaft, by having an opening double its sectional area made into it close to the ceiling; the fire-place below should at the same time be bricked up. The other fire-grate should be remodelled to warm the air admitted. The fire-place selected for this latter purpose should be the one in the outer end wall.

The two small wards could be sufficiently ventilated by Arnott's valves in the chimneys, and an inlet close to the ceiling like those in the other wards.

Ventilation is required for the staircase and passages, and should be effected by a shaft through the roof from the top of the staircase, and perforated panes in the upper row of the windows.

The kitchen should be ventilated by a shaft nine inches square carried from its ceiling above the roof, and perforated glass panes in the windows.

The ward over the kitchen is subdivided by a partition, which should be removed, and a shaft, inlet and remodelled grate provided.

A new ablution and bath room were being constructed behind the hospital, but there was no covered communication between them and the hospital. A covered corridor should be provided. There was no bead on the ablution table.

There are waterclosets for the sick in a projection built out from the half-landing which require reconstruction. They are not sufficiently ventilated, and should have windows on each side, and a shaft through the roof.

There is a privy in the yard behind, recently constructed on Macfarlane's plan, but it requires ventilation.

The hospital wash-house also requires ventilation. It should have fixed tubs, with water laid on, and some means of drying. The dead-house is used as a foul linen store.

The pack store, which is in the yard, has no racks.

In the yard there is a covered ashpit, but the bottom is sunk below the level of the surface. It should be filled up above the level, paved, and drained.

There are no orderlies' rooms, and no accommodation for the sick of soldiers' families.

*The Sanitary Improvements required for Piershill Barrack Hospital are:—*

1. Reducing the number of inmates in the wards as stated above.

2. Completing the ventilation and warming of the larger wards by converting one of the chimney flues into a ventilating shaft and remodelling the fire-grate in the other fire-place (the one in the outer wall). Removing the partition in the ward above the kitchen, and ventilating the ward by a shaft, inlet, and remodelled grate; ventilating the small ward by an Arnott's valve and an inlet; ventilating the waterclosets by windows on opposite sides and a

shaft through the roof; ventilating the kitchen by a shaft through the ceiling and roof, and by perforated glass panes; ventilating the staircase and passages by a shaft and perforated glass panes.

3. Improving the construction of the waterclosets, and ventilating the latrines in the yard.

4. Providing a covered connexion between the new ablution and bath room and the hospital; providing a bead for the ablution table.

5. Hospital wash-house to have fixed tubs and means of drying.

6. Pack store to have racks provided.

### 3. Leith Fort.

Leith Fort consists of a long parallelogram of ground, seven acres in area, situated on the sea-shore between Leith and Newhaven, about two miles from Edinburgh.

The buildings consist of officers' quarters, men's barracks, stables, gun sheds, &c., arranged in the form of a square at the end of the ground furthest from the sea, and 15 to 20 feet above high-water mark. The position is quite open and exposed to the sea breeze. There are ample facilities for drainage, and the fort ought to be healthy.

One important part of the construction of these barracks is the separation of the stables from the men's rooms.

The men's rooms occupy a range of two-story buildings facing the entrance gate on the land side, and the stables are nearly at right angles to them, and have forage stores over the horses. The officers' quarters are behind the men's range, and further back is the hospital.

In arranging the barrack-rooms the ordinary plan of cavalry barracks has been adopted. There is an internal corridor or passage running from end to end of each floor, out of which the men's rooms enter right and left, with windows on one side only. The rooms are of two heights, namely, 9 feet 6 inches and 9 feet 8 inches; and they are of two breadths, namely, 15 feet and 17 feet 1 inch, but they vary in length from 12 feet 8 inches to 45 feet, giving the rooms an appearance of irregularity in plan. The number of windows varies from one to four per room according to the length.

Each room has one fire-place.

There are 22 barrack-rooms with regulation accommodation for 248 men, at from 326 to about 480 cubic feet per man. The following table gives the details for each room :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 19 | 11 | 8 |
| 2 | 20 | 12 | 8 |
| 3 | 10 | 6 | 4 |
| 4 | 11 | 7 | 4 |
| 6 | 5 | 4 | 1 |
| 7 | 5 | 4 | 1 |
| 9 | 9 | 4 | 5 |
| 10 | 9 | 6 | 3 |
| 11 | 14 | 9 | 5 |
| 13 | 19 | 10 | 9 |
| 15 | 20 | 12 | 8 |
| 16 | 11 | 6 | 5 |
| 17 | 5 | 4 | 1 |
| 18 | 12 | 7 | 5 |
| 19 | 4 | 4 | 0 |
| 20 | 5 | 4 | 1 |
| 21 | 13 | 8 | 5 |
| 22 | 5 | 4 | 1 |
| 23 | 14 | 9 | 5 |
| 24 | 11 | 6 | 5 |
| 25 | 15 | 9 | 6 |
| 26 | 12 | 8 | 4 |
| Total | 248 | 154 | 94 |

As there is no serjeant's mess-room in the barrack, one men's room is used for the purpose, but there is no mess kitchen. Another room is used as a tailor's shop, so that, although on the construction, these rooms are not available for diminishing the overcrowding shown in this table. The school-room is also a barrack-room.

Hardly one of the rooms is exactly divisible into equal spaces of 600 cubic feet, but the table shows as nearly as may be what the accommodation at that rate is in each room of the barracks. We should not advise the numbers to be increased in the rooms beyond those we have given, on account of the defective structure of the barrack-rooms, which to a certain extent neutralizes the advantages of the situation.

The barrack as a whole is not an unhealthy one, but a considerable amount of sickness, especially from zymotic diseases, might, in all probability, be prevented by improving its structure as far as practicable.

From the return made to us, it appears that nearly 30 per cent. of the admissions to hospital have been from zymotic diseases, and out of five deaths occurring at Leith Fort during the last five years, two were from fever and one from pulmonary consumption.

The structure of the rooms is such that the beds are only 10 inches apart at the sides, and about 20 inches from foot to foot. In some of the rooms the beds, when folded down, appear to cover nearly the whole floor. Equal in importance to reducing the number of inmates in the rooms, is providing more light and sufficient ventilation throughout the buildings. The corridors are dark and have no means of renewing the air sufficiently at present. To remedy this we would propose to carry up from the ceiling of the upper corridor a sufficient number of large shafts with skylights over them to light these passages, and large gratings should be placed in the floor of the upper corridor under the skylights to allow light to enter the ground-floor corridor. The skylights should also be so arranged as to ventilate both upper and lower corridors effectually. In one locality the communication between the staircase and corridor has been cut off by a wall, which ought, if possible, to be removed, or, if not, large openings should be made in it to allow the air to circulate. Perforated glass panes should also be placed in all the windows opening into the passages or stairs.

Some of the men's rooms are very deficient in light. In all such cases an additional window should be opened.

None of the rooms are ventilated. They all require shafts, inlets, and remodelled grates. The latter are an essential part of the ventilation in this barrack on account of its exposed position.

The ablution room is situated in a down-stairs room in immediate contiguity with men's dormitories, and is complained of with justice on account of the dampness it occasions in the adjoining rooms. It ought to be removed. There is little enough space for men in the building without encroaching on it, especially by conveniences which increase damp in the building. The ablution accommodation is, moreover, much too limited.

There is plenty of space for erecting an ablution and bath room connected with the range, but not under the same roof. This should be done, and two baths with water laid on should be provided in it.

A similar remark applies to the kitchens.

There are two of them also on the ground floor among the men's rooms, but as there is no women's wash-house, one of the kitchens is used for the purpose.

Both should be removed and built outside, and the space obtained by placing the ablution-room, kitchen, and wash-house in a more healthy position might, by a little re-arrangement, be added to the deficient barrack-room accommodation.

Until these additions can be made to the buildings,

the kitchen, women's wash-house, and lavatory should have shafts carried from their ceilings above the roof, and perforated glass panes in the windows.

The present ablution-room should have a bead put to the table and gratings, and pegs should be provided.

An oven has recently been erected in the kitchen.

An abundant and excellent water supply is obtained by contract from the Edinburgh Water Company.

There appears to be some defect in the barrack drainage where it passes the hospital, for unpleasant effluvia are at times complained of, although all the drains are said to be trapped.

The drainage should be carefully examined for the discovery and removal of this defect.

There are two sets of latrines on Macfarlane's principle, but the divisions between the seats are not large enough, and there are no half-doors. In all future applications of these latrines proper divisions with half-doors should be provided. The buildings themselves are quite dark, so that it is impossible to ascertain in what condition the latrines are at any given time. They should be well lighted as well as ventilated through the roof. The urinals are supplied with water for cleansing.

There is a good guard-room, but it has no ventilation. It should have a shaft and louvre through the roof, and a remodelled grate.

The stables are ventilated through the roof, but some temporary stables are very dark.

There are no litter sheds.

The canteen, which is behind the stables, is quite insufficient for the barrack. It requires ventilation by a shaft through the roof and perforated glass panes.

The collar maker's shop, also in the rear of the stables, is too dark, and requires a skylight and roof ventilation.

These barracks are old and require constant repairs, and they are deficient in some requirements, such as day-rooms, married quarters, &c.

*The Sanitary Improvements required are as follow:—*

1. Reduction of the number of men to the extent shown in the table.

2. Ventilation and lighting of the passages by ventilating skylights over shafts in the upper passages and gratings in the floor below. Perforated glass panes to be put into the stairs and passage windows; wall obstructing the ventilation referred to, to be removed or perforated.

3. Dark barrack-rooms to have additional windows. All the barrack-rooms to be ventilated and warmed by shafts, inlets, and remodelled grates. School-room and serjeant's mess to be similarly ventilated. Guard-room to be ventilated by a shaft and remodelled grate. Canteen to be ventilated by shaft and perforated panes of glass. Collar maker's shop to be ventilated and lighted through the roof.

4. Present ablution-room, cook-house, and women's wash-house to be ventilated by shafts and perforated glass panes. Ablution-room to have a bead to the table, and gratings and pegs.

5. Ablution-room, women's wash-house, and kitchens to be removed and reconstructed outside the barrack range. Two baths to be provided for the new ablution-room, and fixed tubs, with water laid on; gratings and a drying and laundry stove to be provided in the new wash-house.

6. Drainage to be examined, and the defect near the hospital remedied.

Latrines to have larger divisions between the seats and half-doors. The latrine buildings to be lighted and ventilated through the roof.

7. Litter sheds to be provided for the stables.

*Leith Fort Hospital.*

This hospital consists of two separate blocks, connected by a covered verandah, suitable as an exercising place for convalescents.

One of the blocks is old, the other is of more recent construction. The old block has a kitchen, surgery, and steward's room on the ground floor, with three wards above.

In the other building are two wards one over the other.

There are six wards on the construction, one of which on the ground floor (No. 1) is unfit for sick. It has only one window, which is obstructed by a wall, and it has no proper means of ventilation.

This ward was formerly a nurse's room. It then was used as a ward. It is now a nurse's room, and should be struck off the construction as a ward altogether.

The itch ward, which is in the attic, has no fire-place, and is not fit for its purpose, but it only contains one bed, and is not likely to be much used.

There are thus only four wards out of six suitable for sick, and these are considerably overcrowded, as will be seen from the following table of the accommodation:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 3 | Not fit for sick | 3 |
| 2 | 6 | 3 | 3 |
| 3 | 6 | 3 | 3 |
| 4 | 8 | 5 | 3 |
| 5 | 8 | 5 | 3 |
| 6 | 1 | 1 | — |
| Total - | 32 | 17 | 15 |

The total accommodation on the construction is 32 beds. Three beds in No. 1 should, at all events, be struck off, and allowing as nearly as may be 1,200 cubic feet per bed, there is space for 17 beds in the two buildings.

The ventilation of all the wards requires improvement. Wards 2 and 3 have no ventilation. One ward has two fire-places. One of these could easily be made into a foul-air shaft by closing up the fire-place below, and making an opening into the shaft close to the ceiling, double the sectional area of the shaft. Wards 2 and 3 would require an inlet each close to the ceiling.

Wards 4 and 5 are provided with Sherringham's ventilators. They have also cold air inlets at the floor. These latter should be closed, as cold air should never be allowed to enter a ward at the floor. These wards have openings in the ceilings, but no shafts. In all the wards where there is not a second flue to serve as a shaft in the way mentioned, a shaft should be carried from the ceiling to above the roof.

All the fire-grates should be remodelled to warm part of the admitted air.

There is neither lavatory nor bath for the sick.

It will be requisite to provide a room with one bath supplied with hot and cold water, and a Macfarlane's ablution table. It should have a covered connexion with the hospital.

There is no hospital wash-house. The kitchen is the place where both patients and linen are washed.

This kitchen is under a sick ward. It is sufficiently supplied with means of cooking diets, but it requires a shaft carried up from its ceiling through the roof to convey away the fumes, and also perforated glass panes in the upper row of the windows.

There are two waterclosets, both of which are defective in ventilation. They each require a shaft nine inches square carried from the ceiling up through the roof, and inlets for air near the ceiling.

In the hospital yard is a Macfarlane's water latrine, but the building is quite dark, and requires light and ventilation through the roof.

Close to the hospital is an ash-pit, which has been a frequent cause of complaint. It ought to be removed entirely.

There is neither provision nor pack store, and there is no space for treating the sick of married soldiers' families.

*The following Improvements are required for this Hospital :—*

1. Ward No. 1 to be struck off the construction, and three beds each to be removed out of wards 2, 3, 4, and 5.

2. Wards 2 and 3 to be provided with foul-air shafts, inlets, and remodelled grates. Wards 4 and 5 to be provided with foul-air shafts and remodelled grates, and the floor ventilators to be closed. Staircases to be ventilated through the roof.

3. A lavatory and bath-room, with bath, ablution table, with sunk basins, and hot and cold water, to be provided and connected with the hospital.

4. A hospital wash-house, with means of washing and drying linen, to be provided, detached from the hospital.

5. Kitchen to be ventilated by a shaft nine inches square, carried above the roof, and by perforated glass panes in the window.

6. Water-closets to be ventilated by shafts and inlets. Latrine in the yard to be properly lighted and ventilated.

7. The ash-pit near the hospital to be removed.

## II. BERWICK-ON-TWEED.

### Infantry Barracks.

These barracks are situated on the eastern side of the town, on elevated ground overlooking the sea. They are near to one of the town gates, and the ramparts rise close to their boundary wall. Part of the buildings of the town adjoin the wall on one side, but the site is elevated and open, and it ought to be healthy.

The barrack-rooms are arranged in two opposite blocks of stone buildings, three stories in height, forming two sides of a small square. The gate forms the third side, and the fourth side is completed by a range of old buildings partly used as cells, stores, &c. Behind each soldiers' range is a very narrow, ill-paved, and badly drained yard.

The buildings are very old and much dilapidated. The floors and ceilings are in a bad condition, the former having dry rot in some places. One outbuilding has to be supported by struts to prevent the walls falling outwards.

There are 72 barrack-rooms in the several men's houses, arranged back to back, four on a flat, with a staircase and passage running from front to back of each house. The rooms are all of a size. They are 20 feet long, 17 feet 3 inches broad, and only 8 feet 3 inches high. They have each two small windows, which open by sliding, and there are openings through the partition wall dividing every two adjoining rooms.

The total accommodation is for 720 men with only 284 cubic feet per man. The details of this excessive overcrowding are given in the following table :—

| Rooms and Houses. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A. 12 Rooms | 120 | 60 | 60 |
| B. 12 „ | 120 | 60 | 60 |
| C. 12 „ | 120 | 60 | 60 |
| D. 12 „ | 120 | 60 | 60 |
| E. 12 „ | 120 | 60 | 60 |
| F. 12 „ | 120 | 60 | 60 |
| Total - | 720 | 360 | 360 |

These barracks will hold five men per room (360 in all) with considerably less than 600 cubic feet per man ; but to enable this to be done not only must the requisite sanitary improvements be carried out, but the whole establishment must be put into a thorough state of repair. At present it is unfit for occupation on account of its bad condition.

One great and irremediable defect in the barrack-rooms is their low ceilings, which are at least two feet lower than they ought to be.

No part of the buildings is ventilated. Each staircase requires a shaft carried up from the ceiling above the roof, and panes of perforated glass in the windows.

Each barrack-room requires a shaft to be carried from the ceiling to above the roof. An inlet for air should also be made through the outer wall, and provision should be made for warming part of the air admitted in winter, by removing the present old pattern grates, and replacing them by remodelled grates. When the barrack-rooms are properly ventilated the openings in the partition walls between the rooms should be permanently closed.

There are gas-burners in all the barrack-rooms.

There is no school-room, except two soldiers' rooms which have been misappropriated for the purpose. These rooms require ventilation by shafts, inlets, and remodelled grates, like the other barrack-rooms.

It is proposed to appropriate part of the large building opposite the gate for a school-room. There would be space enough for the purpose. The room would require roof ventilation.

The guard-room has no ventilation, and the passage leading to the cells is also unventilated. It should have an opening over the door, and perforated glass panes in the end window.

There is neither ablution-room, baths, nor laundry. There is a place used as a women's wash-house outside the barracks, but it is destitute of every convenience for washing and drying linen.

There are two cook-houses, with six boilers in each, but without ovens. They are not in a good state, and require reconstruction.

The ash-pits are much too close to the men's rooms. They ought to be removed entirely and reconstructed in a better situation, or provision should be made for the daily removal of the barrack refuse.

There are two underground cleaning-rooms, but being dark and damp they are never used.

The tailors' shop is also very dark, and is consequently seldom used. It requires light and ventilation through the roof.

The drainage and sewerage is not in good condition, and requires to be repaired.

There is a sufficient water supply from the town works, and also from a spring outside the ramparts.

The present privies should be reconstructed with Macfarlane's water latrines, and should have divisions of seats, half-doors, light, and ventilation.

There is no accommodation for married non-commissioned officers nor soldiers.

Several soldiers' rooms are misappropriated for objects for which accommodation is required.

We have indicated above the chief defects and deficiencies of these barracks. We would strongly recommend, if the barracks are to be retained for service, that they be put into a complete state of repair, and the deficiencies in accommodation supplied as far as the space will admit ; and while carrying on the repairs, the following sanitary improvements should be executed, but without the repairs they would be of little use :—

1. To reduce the number of men on the construction of each room from 10 to a maximum of five men per room.

2. To ventilate each room by a shaft, inlet, and remodelled grate, and to close up the openings between the rooms. To ventilate the staircases and passages by shafts from the ceilings, and perforated panes. Guard-room to be ventilated by a shaft and remodelled grate. Passage leading to the lock-up

cells to have an opening over the door and perforated glass panes in the window at the end.

3. Ablution-room and bath-room, with three baths and water laid on, to be provided.

4. A suitable laundry with fixed tubs, and water laid on, and a drying and laundry stove, to be provided.

5. Cook-houses to be reconstructed and supplied with ovens.

6. Ash-pits to be removed from their present position, and reconstructed at a greater distance from the barrack-rooms.

7. Tailors' shop to be lighted and ventilated.

8. Privies to be reconstructed on Macfarlane's principle.

*Berwick-on-Tweed Hospital.*

The hospital is in keeping with the barracks. It is a small building resembling a cottage house, situated in a narrow lane at a short distance from the barracks, with a small enclosed yard in front, the surface drainage of which is in a bad condition. The hospital consists of a central staircase and passage, out of which the wards and offices enter right and left.

There are six wards with regulation space for 40 beds with from 462 to 525 cubic feet per bed.

On the ground floor is a nurse's room, serjeants' room, store-room, and kitchen, with a ward built out behind, next door to the kitchen. It is a miserable place for sick. There is another ward somewhat better over it. Over the offices are too small wards, with small windows, quite unfit for sick in their present state, and between these wards is the water-closet, which is imperfectly ventilated. On the upper flat are too very inferior attics.

The following table shows the amount of accommodation in each ward :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 9 | 4 | 5 |
| 3 | 9 | 4 | 5 |
| 4 | 7 | 3 | 4 |
| 5 | 7 | 3 | 4 |
| 6 | 4 | 2 | 2 |
| 7 | 4 | 2 | 2 |
| Total - | 40 | 18 | 22 |

These wards would hold 18 sick, if they were in sufficiently good sanitary condition. But the average cubic space would have to be 1,200 cubic feet to enable this to be done.

A slight provision for ventilation has been made by openings in the ceilings of the wards, but it is of little or no use.

The whole building requires to be ventilated and warmed, which we would propose to effect as follows :—The staircase should have a shaft carried from its ceiling to above the roof, and perforated panes should be inserted in the windows. All the windows throughout the building should be made to open at top. Each ward should have a shaft, inlet, and remodelled grate. The kitchen requires a shaft from its ceiling to be carried above the roof, and perforated glass panes to be put into the window.

In all the wards the windows are too small. The largest window is only six feet three inches high, and three feet five inches wide, and there are two wards in which the windows are only four feet high and two feet four inches wide. Were it practicable all the wards should have increased window space.

There are two water-closets within the hospital. They should have shafts carried above the roof and perforated glass panes in the windows.

The kitchen has a grate and boiler but no oven. A proper range with an oven should be provided.

There is no ablution accommodation for the sick, and no bath.

The hospital wash-house requires reconstruction.

Similar remarks apply to this building as to the barracks. If the barrack establishment is to be retained, the hospital must be put into a state of thorough repair, and in doing so the following sanitary improvements should be carried out :—

1. The number of beds in all the wards to be reduced to the number given in the preceding table.

2. Ward windows to be enlarged and sashes to open at top. Staircase to be ventilated by a shaft through the ceiling, and perforated glass panes in the windows. Wards to be ventilated by shafts, inlets, and remodelled grates. Water-closets to be ventilated by shafts and perforated glass panes.

3. Kitchens to be ventilated by a shaft and perforated glass panes, and to be provided with a suitable range and oven.

4. An ablution-room and bath to be provided, and hot and cold water laid on to them.

5. Hospital wash-house to be reconstructed.

## III. STIRLING CASTLE.

Stirling castle is situated on the summit of a rock of basalt about 800 yards distant from the river Forth and about 260 feet above its level. The buildings overlook the whole surrounding country. They are freely exposed to the winds, and occupy a remarkably healthy position.

Properly speaking there are no barracks within the castle more than would accommodate a small guard. The chief structures are the ancient Palace and Parliament House, both of which are used for accommodating soldiers.

The palace was built in 1529, and was converted into a barrack in 1745. The parliament house dates from 1460, and was converted into a barrack in 1801.

The original character of these national buildings has been completely lost sight of in the clumsy alterations which have been made in them, without any corresponding benefit to the soldier, at least in so far as regards the palace barrack, the rooms of which are amongst the worst barrack-rooms we have seen anywhere.

There are in all 20 barrack-rooms in the castle, four of which have been taken off the construction for a library, serjeants' mess-room, and quarter-master's stores.

The remaining 16 rooms have regulation space for 484 men, divided as follows :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Parliament House. | | | |
| 1 | 26 | 22 | 4 |
| 2 | 18 | 16 | 2 |
| 3 | 27 | 22 | 5 |
| 4 | 22 | 16 | 6 |
| 5 | 27 | 27 | — |
| 6 | 22 | 19 | 3 |
| 9 | 22 | 16 | 6 |
| 10 | 28 | 25 | 3 |
| 11 | 22 | 20 | 2 |
| 12 | 24 | 21 | 3 |
| Palace. | | | |
| 13 | 40 | 28 | 12 |
| 14 } | 63 | 54 | 9 |
| 15 } | | | |
| 16 | 46 | 31 | 15 |
| 17 | 48 | 38 | 10 |
| 18 | 49 | 36 | 13 |
| Total - | 484 | 391 | 93 |

If all the barrack-rooms in Stirling castle were suitable for occupation they would hold 391 men at as nearly as may be 600 cubic feet per man. But they differ considerably in their structure. The old parliament house has been cut up by staircases, floors, and partitions, so as to make three flats of tolerably good rooms, varying from 11 feet 9 to 14 feet high in the upper rooms, which are carried into the roof. There is a considerable amount of window space on opposite sides, apparently on account of the large size of the old windows. All the rooms except two have stoves instead of fireplaces.

They have no special means of ventilation, and being without chimney flues they are dependent solely on the doors and windows for renewing the air. There are some openings over the doors into the staircases, but the staircases themselves are not ventilated.

The ventilation of this barrack should be carried out on the usual system, except that the inlets for fresh air could not easily be constructed in the external walls.

We would propose, first, to ventilate the staircases thoroughly by a louvre carried up through the roof from their ceilings and by perforated glass panes in the windows.

We should propose, in the second place, to provide inlets by placing louvre boards over openings above the doors, slanted so as to turn the inflowing current up to the ceiling ; and lastly, a shaft should be carried up from the corner of each room to above the roof.

It would be an improvement in the warming of these rooms to introduce Cundy's stoves instead of the present ones.

All the rooms are supplied with gas.

Two of the lower rooms are flagged instead of being boarded. We consider the boarding of these floors as necessary for health, and would recommend its being done, as has been proposed in the estimates.

There are serjeants' rooms partitioned off from the landings on the two upper floors. These rooms require perforated panes in the windows for ventilation.

The serjeants' mess is on the ground floor. It has no mess kitchen. It would be desirable to restore this room to the construction of the barracks, and to find mess accommodation elsewhere.

The barrack accommodation in the palace is of a very inferior character. The old halls of the building have been crowded with men not only on the floors but on galleries carried round the walls, exhibiting one of the worst barrack arrangements in the three kingdoms.

The men's heads in the upper tiers of beds are above the tops of the windows, and the galleries have neither sufficient light nor ventilation. The only result is damage to an interesting national structure, and the crowding of a number of men within a building incapable from its construction of making a proper barrack.

These galleries should be removed, and were this done the rooms would accommodate half their present inmates, and they would be sufficiently ventilated by glass louvres in the upper row of window panes. The men would have a much larger cubic space than would be requisite in properly built barracks, but this is inevitable.

One or two of the larger rooms in the palace have been subdivided by partitions into serjeants' quarters. They are not very good, but may be improved by inserting a pane of perforated glass into the top row of each window.

There is a chapel school under the armoury ; it has ventilation at different parts near the ceiling.

There are two ablution-rooms, one under the parliament house, the other under the quartermaster's store. It would improve these and similarly arranged ablution-rooms to make the back walls of slate, instead of brick, which soon becomes saturated with water, and is an unavoidable source of damp. One of these ablution-rooms is supplied with Macfarlane's foot-pans and a bath.

The bathing accommodation is not sufficient. Four baths in all would be required for the reduced strength.

There is no proper laundry ; only a very dark room used as a women's wash-house, which is not provided with suitable conveniences. It has no fixed tubs, gratings, nor drying stove, although there is plenty of space for all that is required.

Next the wash-house there is a cleaning shed.

There are two cook-houses, one a large light building, with boilers and an oven, which is stated to consume the large amount of a pound of coal per man in cooking.

The second cook-house is a dark arched room, ventilated into the coal cellar. It has no oven.

There are two ash-pits in arched cellars, into which the ashes are thrown and removed by a separate door. A very good hopper for such ash-pits has been made by Mr. Macfarlane, of Glasgow, and should be applied to these. It diminishes the risk of nuisance, and is cleanly in use.

There is no drill shed. The passages are made use of for drill in wet weather. Water is supplied to these barracks at high pressure from the mains of the Stirling Water Company ; it is very pure and abundant.

There is tank space besides sufficient to hold 136,000 gallons of rain water.

Drinking fountains have been put up with great advantage. They are found to be very useful.

The privies have been recently remodelled on Macfarlane's plan. They are sufficient for sanitary purposes, except that the divisions between the seats are rather too small, and there are no half-doors. It would be well in future reconstructions, with Macfarlane's apparatus, to have them made with proper divisions, and the means of hanging half-doors on them. New urinals have also been supplied, but as they are not cleansed daily they are found to smell. It should be borne in mind that all improved sanitary contrivances require care in using and cleansing them.

The castle drainage is conducted down the rock to a large pit, from which it is allowed to flow over some meadow land.

Nuisance is complained of from this pit by persons frequenting the public walks below. We have been informed that steps are being taken to remedy this evil.

The gate guard-room is unventilated, and requires a louvre through the roof and a remodelled grate.

One of Mackinnel's double tubes, or a Muir's four-point ventilator, 18 inches square, would be sufficient.

The main guard is used as a place of confinement for deserters. It is not properly ventilated, and requires a louvre and remodelled grate like those recommended above.

Under part of the palace is a small, arched, ill-ventilated place, used as a black hole. It is not fit for prisoners.

On the west side of the castle, at about the greatest possible distance from the guard, are the prison cells. They are said to be damp in winter, and they are very inconveniently situated.

There are no quarters for married soldiers within the castle. There is no space for such accommodation, and the want of it is felt to be a great inconvenience. It is stated that there are buildings

adjoining the esplanade outside the castle, which, if purchased, would afford the required accommodation.

Stirling Castle affords an example of the inconveniences arising from an attempt to put buildings to a purpose for which they were never intended. The present construction hardly admits of improvement, even in the way of ordinary barrack accommodation; and, to add to the evil, a depôt has been established within the castle, while there are no conveniences for it.

The first question, as it appears to us, is, to decide whether so many depôts be necessary in Scotland, and whether with the existing railway facilities several of the existing depôts might not be dispensed with.

If the depôt were removed from Stirling Castle the whole question would be much simplified. It would resolve itself into finding within the present buildings sufficient space and conveniences for the small body of troops required for occupation, which is in reality all that can be done with the place. The attempt to crowd men where there is not room for them has led to complicated alterations in the old palace especially, whereby its character has been almost lost without contravailing advantage, while more than once there has been danger of the entire destruction of the buildings by fire. Indeed this may happen at any time under present circumstances.

If the depôt must be retained, we should strongly recommend that a proper barrack be built on the lower plateau adjoining the castle, or on some equally advantageous position, and suitably provided with conveniences. If this be decided on, the best thing to do would be to remove the men altogether from the old rooms, and to put them into a thorough state of repair.

*We shall confine our Recommendations, therefore, to the most needful Improvements. They are as follow:—*

1. Removing the men from the galleries of the palace rooms, and removing the galleries altogether; reducing the number of men in all the parliament house rooms to the extent shown in the table.

2. Ventilating the palace rooms by glass louvres in the top window panes. Ventilating the parliament house rooms by shafts from the ceilings to above the roof, and by louvred openings over the door. Ventilating the staircases by louvres and perforated panes. Serjeants' rooms to have perforated glass panes in the windows. Cundy's stoves to be used for warming the barrack-rooms.

3. Flagged floors of the lower barrack-rooms to be boarded.

4. Bathing accommodation to be extended up to four baths, with water laid on.

5. Women's wash-house to be provided with fixed tubs, gratings, water laid on, and a drying stove.

6. Ash-pits to be supplied with Macfarlane's hopper.

7. Both guard-rooms to be ventilated by louvres through the roof and remodelled grates.

### *Stirling Castle Hospital.*

The building appropriated to this hospital is an ancient house belonging to the Argyle family. It is situated at the end of the castle esplanade nearest the town, and opens on the public street. In front is a court, bounded on three sides by buildings, and on the remaining side by a wall. The part appropriated for sick is entered by a large lobby and staircase, out of which the old rooms now used as wards open.

There are four rooms used for sick. They vary from 21 to 46 feet in length. They are about 19½ feet broad. Two of them are 9 feet 4 inches high, and two 11 feet 9 inches high. They contain in all 39 beds, with a space varying from 594 to 827 cubic feet per bed.

The details of the accommodation are given in the following table, contrasted with what the accommodation would be at about 1,200 cubic feet per bed:—

| Wards. | Total present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 14 | 7 | 7 |
| 2 | 6 | 4 | 2 |
| 3 | 13 | 7 | 6 |
| 4 | 6 | 3 | 3 |
| Total - | 39 | 21 | 18 |

At an average space of as nearly as may be 1,200 cubic feet these rooms will accommodate 21 beds.

The larger wards have one six the other five windows, placed opposite each other, and the two smaller wards have each two windows.

There are separate rooms for the serjeants and orderlies.

Besides being overcrowded, these wards have no means of ventilation, and the air in them is very impure.

To remedy this defect we would advise that a shaft be carried from the ceiling of each ward to above the roof of the building, that the larger wards have two inlets for air, one on each of the opposite sides, and that the two smaller wards have each one inlet.

The staircase also requires ventilation by a louvre through the roof and perforated panes in the windows.

In the two upper wards there are two blank windows which might be advantageously opened.

The fireplaces are of old construction, and are so imperfectly fitted up that they smoke almost continually. They should be contracted in the throat and remodelled. But in doing so care should be taken not to injure the structure.

An ablution-room, with a Macfarlane's basin and a bath, has recently been provided, but hot water has not been laid on, and the present means of heating water in the kitchen are deficient.

The water-closets are on Macfarlane's plan, and are outside the building, but connected with it by a covered way. These closets are deficient in ventilation, and should be improved in this particular.

There is no hospital laundry. The provision store is not good. There is no accommodation for the sick of soldiers' families.

Taken as a whole this hospital cannot be described as being good, but it may be materially improved in every way except in overcrowding, which can only be removed by increasing the extent of space for the sick.

*We have indicated above the chief Sanitary Improvements, which may be summed up as follows:—*

1. Reducing the number of beds in each ward to the extent shown in the table.

2. Ventilating each ward by a shaft and inlets, and remodelled grates. Ventilating the staircase by a louvre and perforated glass panes.

3. Laying on hot water to the bath and ablution room.

4. Improving the ventilation of the water-closets.

With regard to additional hospital accommodation, this might be obtained in the present buildings by removing out of them a number of offices and quarters; or, if the barracks be extended, provision for a separate hospital might be made, better adapted for its object than is this old mansion.

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## IV. GLASGOW BARRACKS.

There are two barracks in the city of Glasgow, one for infantry, to which the hospital is attached, and another for recruits.

### 1. Glasgow Infantry Barracks.

These barracks are situated at the east end of Glasgow within a square surrounded by high walls, and containing an area of 4a. 2r. 3p. The front wall and gate skirt a wide public street, and on the three other sides the boundary is isolated from dwelling houses by streets. The river Clyde passes about half a mile distant, at a level not much below that of the barrack. The subsoil is clay, resting on sandstone.

The buildings are about 60 years old, and are all of stone. They consist of two blocks of men's quarters, one on either side the parade ground, with a block of officers' quarters at the upper end between them. Behind the officers' quarters, and close to the back boundary wall, are the hospital, prison, barrack, offices, &c.

The local position of these barracks is not a very good one, and the buildings are in a defective state of repair, so much so that they have been condemned, and sites have been sought on which to construct new barracks.

The men's rooms are in six houses, three in each range. These houses are four stories high, and are reached by passages and stone staircases running through and through the buildings, giving entrance right and left to the rooms.

The rooms are back to back, and have each one window 3 feet 10 inches high by 9 feet in width. There are 66 men's rooms, all of a size. They are 26 feet long, 20 feet broad, and 9 feet 4 inches high. Each room has regulation accommodation for 12 men at 404 cubic feet per man. The total accommodation, compared with what it would be at 600 cubic feet per man, is as follows :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 66 | 792 | 528 | 264 |

There is accommodation for only 528 men in these rooms, and it will be necessary to reduce the regulation number of men from 12 to 8 per room.

There is a certain extent of ventilation provided by circular openings through the end wall of each room into the staircases, by circular openings between the rooms, and by a few openings apparently into the chimneys.

The plan is not well arranged, and would really do little more than allow the foul air of all the rooms to intermingle. We are of opinion, nevertheless, that much may be done to improve the present ventilation at a trivial cost, without incurring the expense of ventilating shafts, which we scruple to recommend in this instance, as the barrack will probably be given up in a short time.

We would propose to ventilate each staircase more efficiently than it is at present by carrying a large louvre through the roof from the ceiling, and by inserting four squares of perforated glass into the upper sash of each stair window.

We would next propose to improve the method of admitting fresh air into the rooms from the staircases, by providing the circular openings from the staircases into the rooms with wooden louvre boards, so arranged as to throw the inflowing air current towards the ceiling of the room.

We would further propose to obtain an outlet for foul air by placing a large-sized Arnott's silk flap ventilator into each chimney close to the ceiling; and in order to preserve the ventilation of each room distinct from that of the others, we would close permanently all the circular openings between the rooms.

The men's rooms are lighted by candles, but there is gas in the library.

It is doubtful if the cost of introducing gas into the barrack-rooms should be incurred, especially as the barrack is not to be permanently used.

There is a school-room on the first floor of one of the houses. It consists of two barrack-rooms thrown into one. It has two fireplaces, with an Arnott's ventilator introduced into the chimney of each, and it has circular openings into the staircase for admitting air. These openings should be provided with louvres like those in the barrack-rooms.

The infant school is a barrack-room, and requires ventilation in a manner similar to those rooms.

One of the ground-floor rooms is used as a library and requires ventilation in a similar manner.

Four ground-floor rooms, two in each wing, have been set apart as ablution-rooms. The position of these rooms is very objectionable, from their tendency to diffuse damp air through the buildings, and were the barracks intended for permanent occupation we should have recommended their entire removal. These ablution-rooms are provided with slate tables, for which it is proposed to substitute fixed iron basins and footpans, on Macfarlane's principle. As there are no baths, it would have been better, under the circumstances, to have left the present tables as they are, and to have put up baths with the money, but not in these rooms. Five baths would be required for the reduced strength consequent on allowing 600 cubic feet of space per man.

These ablution-rooms have neither gratings, pegs, nor forms, all of which could be supplied at a small cost; and the rooms also require ventilation by perforated glass panes in the windows.

There are two women's wash-houses also on the ground floor of the blocks, and under men's rooms. Their position is most objectionable; so much so, that it would be very desirable to remove them altogether; a measure which we should recommend were the barracks to be considered as permanent. A similar remark applies to the cook-houses, of which there are five, all situated under the men's rooms. They are supplied with boilers, and ovens have been authorized, which are to be placed, not in the present cook-houses, but in buildings at the end of each range now used as cleaning-sheds.

Means should be taken to ventilate the cook-houses and wash-houses as efficiently as possible, either by shafts 12 inches square, carried up from the ceiling of each above the roof, or by large openings through the external walls close to the ceilings.

Until recently, the privies of these barracks were placed over cesspits, and were a great nuisance, but they have been reconstructed on Macfarlane's principle, with receptacles in which water will stand; and as there were no drains for removing their contents, a plan has been introduced for doing so, which can be applied in many barracks similarly circumstanced. The ground behind the latrine is lowered, so as to permit a water-tight cart to be placed under the pipe leading from the latrine. The lid of the cart is opened, and the contents of the latrine are flushed into it, and removed. This plan is safe and inoffensive, but as it is of importance to limit the quantity of water used in flushing, so as not to overload the cart, the soil is not effectually washed away with water, as it would be if the pipe terminated in a drain, and hence it is needful to have the latrine properly cleaned out by hand labour. This is done in the public latrines which have been established on the same principle in Glasgow, but it is not done in the barrack latrine, and hence all the advantages of the system of removal are not obtained. It is a point of management which could be easily carried out.

The buildings containing these latrines require more light through the roof.

The urinals are of a very defective form, and should be reconstructed, and supplied with water.

Ash-pits are in use in these barracks. They are large and deep, and they are besides unnecessary, as a cart would answer every purpose of collecting and removing the barrack refuse daily.

There is an ample water supply derived from the Glasgow Water Company, at a rent of 40*l.* per annum.

The guard-room has two openings through the ceiling into the roof, but these are not sufficient for ventilation. A shaft should be carried from one of the openings up through the roof. It should have louvres to the open air; and about six inches below the ceiling, and under the opening of the shaft, there should be louvres placed to throw any accidental down draft towards the ceiling. The guard-room grate should be remodelled, to warm part of the air admitted.

The canteen tap-room and non-commissioned officers' room are unventilated, and require Arnott's silk flap ventilators into the chimneys.

There is no covered drill shed; nor is there any space on which to erect one. The accommodation for trades is deficient, and there is no accommodation for married soldiers.

The floors of nearly all the soldiers' rooms are worn out, as are also the stone steps of the stairs, &c.

As a new barrack is in contemplation, and a site is being selected, we do not consider it to be necessary to do more for the present buildings than to advise the most urgent sanitary improvements to be carried out in the simplest practicable way, and at the least possible cost.

*These improvements are as follow:—*

1. Reduction of the number of inmates from 12 men to eight men per room.

2. Ventilation of all the staircases and passages by louvres carried from the ceiling of the stair through the roof, and by perforated glass panes in the windows. Ventilation of all the barrack-rooms by a large-sized Arnott's ventilator into the chimney, and by louvre boards placed in the circular openings from the staircase, the boards being arranged to throw the inflowing current up to the ceiling. Similar louvre boards to be provided for the openings in the library, school-room, and infants' school; the two latter to be provided with Arnott's ventilators. All the circular openings between the rooms to be closed. Serjeants' rooms to have Arnott's ventilators in the chimneys.

Guard-room to be ventilated by a shaft carried through the roof, and louvre boarding to be placed 6 inches below the opening of the shaft, to throw any accidental down draft up to the ceiling. Guard-room grate to be remodelled, to warm part of the air admitted. Canteen tap-room and non-commissioned officers' room to be ventilated by an Arnott's ventilator into the chimney.

3. Ablution-rooms to be provided with gratings, pegs, and forms, and to be ventilated by perforated glass panes in the windows.

4. A bath-house, with five baths, and water laid on, to be provided.

5. Cook-houses and wash-houses to be ventilated in one of the ways pointed out.

6. Urinals to be reconstructed, and supplied with water.

7. Ash-pits to be abolished, and carts for the daily collecting and removal of the refuse to be substituted. Arrangements to be made for the daily cleansing of the latrines.

*Glasgow Barrack Hospital.*

This building is situated behind the officers' quarters. It is three stories high, and consists of two wings, with a centre projecting behind them. In the centre there is a spacious entrance and staircase reaching the whole height of the building. The wards and offices enter right and left from it, and the kitchen, wash-house, ablution-room, &c. are in a small yard behind.

The building, taken as a whole, is by no means in a good condition. The oil painting is in a bad state, and the walls and ceilings were not clean at the time we were there.

Necessary improvements have been delayed, apparently because the barrack has been condemned; but we would submit that the hospital should at all events be properly kept until the day of its evacuation.

There are five wards, all nearly of the same dimensions. All are 42 feet long, four of them are 21 feet broad and 10 feet high, and one is 20 feet broad and 11 feet high. The present regulation accommodation is for 80 beds, disposed as follows:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 16 | 8 | 8 |
| 3 | 16 | 8 | 8 |
| 4 | 16 | 8 | 8 |
| 5 | 16 | 8 | 8 |
| 6 | 16 | 8 | 8 |
| Total - | 80 | 40 | 40 |

The space in the wards will not divide equally so as to give 1,200 cubic feet per bed. Each ward will hold eight beds, at a trifle more than 1,100 cubic feet per bed, and we would propose to fix this number as the maximum for each ward.

Part of the hospital accommodation is misappropriated for recruiting purposes. The serjeant's room and surgery on the ground-floor are so used, and the result is that a ward is taken off the construction for the use of the serjeant, and a room has to be found for the surgery.

We should advise that the recruiting duty should be at once removed to the new recruiting barrack, and that as much of the additional ward accommodation as possible be provided by restoring the rooms to the hospital, after putting them into a fit condition to receive sick.

Each ward has seven windows, all of which have the upper sashes hung with cords and pulleys to draw down; but none of the lower sashes are moveable. This is a defect which ought to be remedied.

Some ventilation is provided by two beams above the ceilings connected with the external air, but this method does not act efficiently in practice.

The existing openings in the ceilings can, however, be used as inlets, by removing the sliding covers, and placing a wooden louvre about six inches below each opening, so disposed as to throw the inflowing air-current up towards the ceiling, instead of permitting it to fall into the ward. It will be necessary at the same time to provide an outlet shaft for foul air, and this can be most easily and economically done by using one of the chimneys, of which there are two to each ward, as an outlet shaft.

The chimney furthest from the outer wall of each ward should be selected for the purpose. It should be bricked up below, and an opening made into the chimney shaft close to the ceiling. This opening should be double the sectional area of the shaft. The opening should be covered by a louvre, the blades of which slant upwards towards the ceiling, so as to throw any accidental down draft up to the ceiling.

The remaining fire-grate should be remodelled to warm part of the air admitted.

The hospital serjeants' and orderlies' rooms should have Arnott's silk flap ventilators introduced into the chimneys.

Ventilation is required for the staircase and passages. This could readily be provided by a shaft 18 inches square, to be carried from the ceiling of the staircase through the roof, to be protected above by louvres. Perforated glass panes should also be placed in the stair windows.

The hospital is lighted by candles. Although gas

would be a great improvement, we should not consider it necessary to incur the cost of its introduction, unless there were no immediate prospect of the removal of the barrack.

The means of ablution and bathing for the sick are defective. They consist of a detached wash-house behind the hospital, in which are three basins and a slipper and shower bath, the latter being unserviceable.

The place is not fit for sick men to go to, and it would be very advisable, as a temporary expedient, to find space for two or three of Macfarlane's wash-hand basins within the hospital.

More permanent provision of ablution and bathing accommodation would of course be necessary if the hospital itself were to be considered as permanent.

Connected with the first floor of the hospital are two water-closets, neither of which has any independent means of ventilation. A louvred shaft a foot square should be carried from their ceilings up through the roof.

In the back yard behind the hospital is the kitchen. It has an oven, but it is not sufficiently supplied with means of cooking, except for temporary purposes. Close to the kitchen is a large deep covered ash-pit, which is simply a nuisance, and ought to be removed altogether. An iron barrow, placed where the ash-pit is, would be sufficient for the daily collection and removal of the refuse.

This hospital, like the barracks, is in a defective state of repair. For a similar reason, and in the hope that the whole establishment may be speedily removed, we shall limit our recommendations to those matters which are of immediate necessity for the welfare of the sick. *These are as follow:—*

1. Reducing the number of beds in each ward to the extent we have pointed out.

2. Removing the recruiting duty out of the hospital, restoring the rooms occupied by it to the hospital, and arranging the accommodation so as to have as much ward space as possible.

3. Ventilating each ward by converting one chimney into an outlet shaft, and by placing louvres over the present ceiling ventilators, as described. Remodelling the grates, to warm part of the admitted air. Ventilating the staircase by a shaft and perforated panes. Ventilating the water-closets by shafts, and the serjeants' and orderlies' rooms by Arnott's ventilators.

4. Providing ablution accommodation within the building.

5. Removing the ash-pit, and providing a barrow for the daily removal of the refuse.

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### 2. Glasgow Recruiting Barrack.

This barrack is situated in Shamrock-street, towards the north-western extremity of Glasgow. It is quite new, and consists of two dwelling houses, leased for ten years at a high rent. They were built for the purpose of a barrack by a private individual, but as they are merely held on lease, he has arranged them so as to be able to convert them into dwelling houses afterwards.

The two houses are exactly alike, and are in the line of the street. They have a yard at the back, the only access to which is through the houses.

Each house has a ground floor and three upper floors. On the ground floor are four rooms in each house, of which one is an ablution and bath-room, with a range of Mr. Macfarlane's fixed basins and foot-pans, a bath with hot and cold water laid on, and also a shower bath. The other ground-floor rooms are appropriated as stores, barrack serjeants' quarters, guard-room, and one is temporarily allotted as a dining-room for the men. This latter room requires properly fitted up seats round the wall, &c. Upstairs there are two large rooms, and one small room off each landing. The large rooms have been formed by leaving out the partitions between two rooms, and hence they have windows at each end, and two fireplaces. Some rooms have three fireplaces, from a similar cause. There is a small grate of fair radiating power fitted to each fireplace, and gas is laid on to all the rooms. There is also a leaden sink with a cover, and water laid on in each room. None of the rooms are ventilated. We would propose to remedy this defect by converting one of the chimneys into a shaft for removing foul air, by having an opening made into it near the ceiling, covered with a grating, giving a clear sectional area double that of the chimney; the other chimneys should have Arnott's large sized ventilators introduced close to the ceiling. In order to provide inlets for fresh air, one pane in the upper part of each window should be of perforated glass.

The small rooms on the landings are intended for non-commissioned officers, and should have each an Arnott's ventilator in the chimney. These rooms have each a range with oven and boiler, also a sink with water laid on, and they are lighted with gas.

A wooden partition is put up to contain the bed.

The passages and staircases require to be ventilated. This can easily be accomplished by carrying a shaft 12 inches square from the ceiling of the staircase up through the roof. The shaft should be protected by louvres. The stair windows should have perforated panes to act as inlets.

The kitchen has boilers of the ordinary pattern, but no oven.

The women's wash-houses, of which there are two, have fixed tubs, with water laid on, and gratings, and also a louvre in roof. There is a dark unventilated water-closet inside each wash-house. A shaft should be carried from the ceiling of each, up to a louvre in the roof, and additional light should, if possible, be given. There is no drying stove.

The privy is of Macfarlane's ordinary construction of water latrine, with small divisions, but the lean-to building in which it is placed is deficient in light and ventilation, and the latrine is not properly kept. A skylight and louvre should be placed in the roof.

The guard-room, which is a room on the ground floor, should have an Arnott's ventilator in the chimney.

It is unnecessary to do more to this barrack, as it is only on a lease, and the recruits are a very short time there; indeed it is better in structure and arrangement than many buildings erected expressly as barracks.

*Our recommendations are therefore as follow:—*

1. Ventilation of the rooms by converting one of the chimneys into an outlet shaft in the manner described, by introducing Arnott's ventilators into all the other chimneys, including the guard-room, and a pane of perforated glass into the upper row of each window; ventilation of the staircases and passages by shafts and perforated panes.

2. Ventilation of the water-closets in the wash-houses by shafts; ventilation and lighting of the latrines by a louvre and skylight.

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## V. AYR INFANTRY BARRACKS.

These buildings were not originally destined for their present use. They were built in the year 1794 for a sugar house, and have been altered and added to in order to render them fit for barracks.

The enclosure within which they are situated is a strip of sandy land lying between the river Ayr and the sea at the extremity of the town of Ayr. Its area is 5 acres and 28 perches. Its surface level is not much raised above high-water mark, but as the buildings are only about 50 yards from the sea, and freely exposed to the sea breeze, the position is a healthy one.

The men's rooms are in a large block placed near the middle of the enclosure. This block consists of

a centre and two wings in line. The centre is six stories high, and the wings are four stories high. Access is obtained to the rooms by two through and through passages and staircases, the latter of which are carried up between the centre and the wings. Out of the landings entrance is obtained to six stories of men's rooms on one side of the stair, and to four stories of rooms on the other side.

The stairs are very much out of repair, and have to be supported by struts, to prevent their giving way. The staircases are, however, roomy, light, and admit of easy ventilation.

The rooms are back to back, with two low windows on one side, and the window sashes slide horizontally. There are two circular openings through the wall between each pair of rooms. They are intended to facilitate ventilation ; but if both sets of rooms were occupied by men these openings would be injurious, by allowing the foul air of the rooms to pass from one room to the other.

There are in all 36 men's rooms, three of which, Nos. 4, 5, and 6, are occupied by the pensioners' establishment, although they are still on the construction as men's rooms. By present regulation these rooms contain 12 men each, and there ought to be space for 432 men in the building, with from 333 to 368 cubic feet per man.

The following table gives the details of this accommodation :—

| Rooms. | Total present Regulation Number of Men. | Total Number of Men at 600 Cubic Feet each. | Total Deficiency of Accommodation in Men. | Number of Men to be placed in each Room. |
|---|---|---|---|---|
| Nos. 3, 6, 7, 10, 11, 14, 21, 24, 25, 28, 29 - | 132 | 77 | 55 | 7 |
| Nos. 1, 2, 4, 5, 8, 9, 12, 13, 15, 16, 17, 18, 19, 20, 22, 23, 26, 27, 30, 31, 32, 33, 34, 35, 36 | 300 | 200 | 100 | 8 |
| Total - | 432 | 277 | 155 | — |

In this as in other similar cases we have not exacted 600 cubic feet per man, on account of the position and exposure of the barrack, and the very free external ventilation of the buildings generally.

It will be necessary, however, to reduce the numbers of men in the first set of rooms in the table from 12 to 7 men per room, and in the second set from 12 to 8 per room, to give the minimum cubic space each man should have.

None of the rooms are ventilated, and they will each require a shaft of the proper sectional area to be carried from the corner of each room to above the roof. It would be both difficult and expensive to provide inlets of the usual construction, on account of the great thickness of the walls. We would, therefore, propose to admit fresh air to the rooms from the staircases, taking every precaution at the same time to keep the staircases freely ventilated. The easiest way of providing an inlet from the stair would be to cut an opening of the required sectional area over the door frame and under the stone lintel. The opening should slant upwards, and enter the room near the ceiling, and, if necessary, a louvre board should be placed over it within the room, to throw the inflowing air current up to the ceiling.

The rooms are warmed by a very defective old form of fire-grate. It ought to be remodelled, to warm part of the admitted air ; but it appears doubtful whether the expense of constructing the proper flue in walls of such solidity would not be too great. This question will have to be settled by an estimate, and if the cost be excessive, it will be necessary to provide some other method of warming the air. In any case, however, new fire-grates would be required. Those on the principle of the Anglo-American stove would be the best.

As we propose to admit the fresh air required for all the rooms from the staircases, it will be requisite to ventilate the staircases efficiently by carrying a louvred shaft from the top of each through the ceiling and roof. Perforated glass panes would also have to be placed in all the windows.

If it be found too expensive to remodel the fire-grates, the next best expedient would be to heat the air admitted into the staircases in winter by placing a Nettleton's stove, or one of the ribbed stoves of Mr. Goldsworthy Gurney, on the first landing of each staircase. Additional cost would, however, have to be incurred for coals and superintendence if this plan of warming the air were adopted. Estimates for both plans should be prepared, including the last contingencies.

All the rooms are lighted with candles, although gas could be readily obtained. A ventilated gas-burner should be introduced into each room.

There are no non-commissioned officers' rooms, except the barrack-rooms, and there is no accommodation for married soldiers. There are no cleaning-rooms, drill sheds, nor workshops.

There is no day-room, school-room, nor library. There are neither ablution-rooms nor baths.

There are four cook-houses furnished with coppers, but without ovens. Two of these cook-houses would be sufficient for the wants of the men ; and it has been proposed to convert the other two, one at the foot of each staircase, into an ablution-room.

The objection to this, and indeed to the present position of the cook-houses, is that they would all ventilate themselves directly into the staircases, out of which the rooms are to be supplied with fresh air. The only way to avoid this evil would be to close up the present doors into the staircases, and to open a door for each cook-house and lavatory to the external air. If this were done, and if perforated glass panes were put into the upper row of the windows in the kitchens and lavatories, the effluvia and damp from them would be no detriment to the men's rooms.

Each cook-house should have an oven. Three baths, with water laid on, would be required.

The women's wash-house is too dark. There is a hood over the boiler to carry off the steam. There are no gratings nor fixed tubs, and there is no drying stove.

The present water supply is derived from two wells about 20 feet deep. They are excavated in a sandy soil, about 50 or 60 feet from the barrack cesspits. The water is stated to be very hard, and unfit for washing clothes.

We have been informed that authority has been given for laying on the town water, and the sooner this is done the better.

There are three privies, all in a very bad and unwholesome condition. They are of the usual construction ; dark, unventilated, and placed over cesspits. Behind the privy is a large hole, which serves as an ash-pit, and into which the carts are led to remove the filth and refuse. This hole had a considerable quantity of liquid filth in it.

There is no drainage, except surface drainage, although a ready outlet could be obtained to the sea.

All the privies should be forthwith reconstructed as water latrines on Macfarlane's principle, and they should have sufficient light and ventilation provided through the roof.

One of two ways might be adopted for cleansing them. The latrines and water-closets of both barrack

and hospital might be readily drained by carefully laid pipe drains to the sea. Or, if it be an object to save the manure, a plan similar to that in use at Glasgow barracks might be adopted, by which the contents of the latrines, water-closets, and urinals might be discharged into a water-tight covered cart, and removed daily. When the privies are reconstructed, proper urinals supplied with water for cleansing should also be provided.

There is a good light guard-room with a verandah. There are two round openings in the ceiling for ventilation, but they are not enough. One of them should be converted into a louvred shaft, and carried through the roof. The fire-grate should also be remodelled, to heat part of the air admitted.

Two cells adjoining are ventilated and lighted by grated openings at a considerable height. It would improve the ventilation to make an opening through the ceiling into the roof, and a louvred opening in the ridge.

There is a good canteen, unoccupied at present. It has a light cheerful tap-room, which might very well be used for a day-room or reading-room for the men.

*The following are the Sanitary Improvements required for Ayr Barracks;—*

1. Reduction of the numbers of men in each room to the extent specified.

2. Ventilation of each room by a shaft carried from the ceiling to above the roof. An inlet for air to be provided over each door. The openings between the rooms to be closed up. The staircase to be ventilated by a louvred shaft, and perforated panes in the windows. The admitted air to be warmed in winter, either by remodelling the grates, or by stoves in the staircases, as described.

3. A ventilated gas-burner to be introduced into every barrack-room.

4. Two of the cook-houses to be provided with ovens; to be ventilated by perforated glass panes, and to have a new door to the open air, and the present doors into the passage to be closed.

5. Two ablution-rooms to be made out of two cook-houses, to be ventilated in a similar manner, and a similar change in the doors to be made. Three baths with water laid on to be provided.

6. Women's wash-house to be provided with fixed tubs, and water laid on, gratings, and a drying and laundry stove. More light to be given.

7. Town water supply to be introduced.

8. All privies to be reconstructed as water latrines on Macfarlane's principle, and their contents disposed of in one of the ways mentioned. All cesspits to be abolished, and the ash-pits to be filled up to above the level of the ground, and to be properly paved and drained. Urinals to be reconstructed, and supplied with water.

9. Ventilation of guard-room to be improved by a shaft and remodelled grate, and the ventilation of the cells by openings in the ceiling and ridge, as described.

### *Ayr Barracks Hospital.*

This hospital is situated at one end of the parade ground under a low cliff, which at this point overlooks the barrack enclosure. The building is two stories high, and has a roomy light passage and staircase from front to back.

The kitchen, privies, wash-house, dead-house, &c., are in a small back yard.

On the ground floor are placed a large and small ward and the serjeants' room, and over these are a large and small ward and the surgery.

The two large wards are each 40 feet long, 23 feet broad, and 11 feet 3 inches high, and they have three windows on each of the opposite sides, with the beds ranged between them. They look spacious, light, and cheerful, although the window sills are rather too high.

There is regulation space for 40 beds, disposed as follows:—

| Wards. | Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 18 | 9 | 9 |
| 2 | 18 | 9 | 9 |
| 3 | 2 | 2 | — |
| 4 | 2 | 2 | — |
| Total - | 40 | 22 | 18 |

The two larger wards will hold nine beds each, with 1,150 cubic feet per bed, and the two smaller wards will hold two beds each, at 950 cubic feet per bed. Twenty-two beds is, therefore, the maximum number which the hospital ought to contain.

Only one ward has any provision for ventilation by openings in the ceiling, but the method is defective; and we would advise a proper system of ventilation to be introduced throughout the hospital.

Each of the large wards Nos. 1 and 2, has two fireplaces, one at each end. We would recommend that the fireplaces in these wards against the outer walls should have remodelled grates, for warming part of the air admitted in winter, and the other fireplace being unnecessary might be built up, and the chimney flue might be converted into an air shaft, by making an opening into it double the sectional area of the flue. This opening ought to be made close to the ceiling.

Two inlets for air would also be required, one on each side of the long wards close to the ceiling, but not opposite each other. The present ventilating openings in the ceiling should then be closed.

The two smaller wards would be sufficiently ventilated by a large sized Arnott's silk flap ventilator in the chimney, and by one inlet for air close to the ceiling.

The passage and staircase windows should have a few perforated glass panes introduced into the upper sashes.

The wards are lighted with candles. When gas is introduced into the barracks, a properly ventilated gas-burner should be put up in each ward.

There is no lavatory nor bath-room for the sick, and there are no water-closets; but there are two most offensive privies over cesspits in the yard. An addition might easily be made to the hospital, containing a bath, with hot and cold water (the former supplied from the kitchen), a Macfarlane's ablution table, and a water-closet.

The cesspits in the hospital yard should be abolished, and the privies drained, and reconstructed with Macfarlane's water latrines.

The hospital wash-house has a boiler, but no fixed tubs. It is too dark, and requires a skylight, and a louvre for ventilation.

The hospital water supply is at present derived from the pumps in the barrack yard. The town water should be introduced over the hospital when it is brought into the barracks.

The kitchen is imperfectly supplied with means of cooking. It requires a proper range with an oven, and when this is done means of heating the bath recommended above should be introduced.

This hospital is deficient in bedding store, pack store, and provision store; and there is no accommodation for the sick of soldiers' families.

*The following are the Sanitary Improvements required;—*

1. Reduction of the number of sick to the extent stated.

2. Ventilation of the two large wards, by converting one chimney flue into a ventilating shaft

in the manner described, and by two inlets for air. One fire-grate to be remodelled to warm part of the air admitted. The two smaller wards to be ventilated by Arnott's silk flap ventilators, and by one inlet each. Stair and passage windows to be ventilated by perforated panes.

3. A ventilated gas-burner to be introduced into each ward.

4. An addition to the hospital to be made, capable of containing a bath with hot and cold water, the former supplied from the kitchen, an ablution table, and a water-closet.

5. All cesspits to be abolished, and the hospital privies drained, and reconstructed with a Macfarlane's water latrine.

6. Hospital wash-house to have fixed tubs, and water laid on, and to be better lighted and ventilated.

7. A proper water supply to be provided for the hospital.

8. Kitchen to be provided with a proper cooking range.

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## VI. PAISLEY BARRACKS.

These barracks are situated on the north side of the high road leading from Paisley to Glasgow, at about a mile distant from the former town.

The enclosure is a parallelogram six acres in extent, very slightly elevated above the general level of the surrounding district. The neighbourhood is open, airy, and healthy.

These barracks were erected in 1821, and the buildings are all of stone. Along one side of the parade ground, and parallel with the high road, is a long block of buildings containing men's quarters. The adjacent western side is occupied by officers' quarters and by the hospital. The remaining sides are open.

Between the men's quarters and the boundary wall is a row of low buildings, containing workshops, offices, &c.

The rooms are arranged in six houses, two stories high. There are four rooms to each house, but there are no thorough passages and staircases such as exist in the better class of barracks, and access is obtained to the rooms by a wooden lobby and stair boxed off from the cubic contents of the rooms. By this arrangement 490 cubic feet are taken from the contents of each room. The plan is a bad one, because it complicates the structure, and interferes with ventilation. These defects of structure are still further increased in some of the rooms by a serjeant's bunk being placed behind the projection caused by the staircase. The arrangement gives the rooms a gloomy uncomfortable appearance, while it tends to stagnate the air in them, and to render ventilation difficult.

The rooms are all of a size, and are intended by existing regulations to hold 15 men each. The following table shows the accommodation, contrasted with what it would be at about 600 cubic feet per man :—

| Number of Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Number of Men to be placed in each Room. |
|---|---|---|---|---|
| 16 | 240 | 176 | 64 | 11 |

By reducing the regulation number of men per room from 15 to 11, each man will have under 600 cubic feet, and 11 men is the maximum number which ought to be placed in a room.

Each room has two windows, one at either end, They are fixed below, but the upper sash opens on a pivot.

There are openings in the ceiling for ventilation, but they are not enough. Each room will require a shaft carried from the ceiling to above the roof, and two inlets for fresh air, one on each side above the windows.

The fire-grates are of a wasteful construction, and should be replaced by remodelled grates, to warm part of the admitted air.

All the rooms are lighted with gas.

There is no day-room for the men.

A men's room has been taken off the construction as a school-room. It requires to be ventilated, like the barrack-rooms.

Another men's room has been set apart as a library, and the librarian's quarter is a wooden bunk in the corner.

The ablution-room is fitted up in the usual manner with benches, water-basins, &c. The bench requires a bead to prevent the water dashing over on the men. There are no pegs, and there is no bath. One bath has been authorized. There ought to be two.

The ablution-room requires more light and ventilation through the roof.

There is a women's wash-house, but it is imperfectly fitted up, and requires fixed tubs, with water laid on, a grating to stand on, and a drying stove.

The cook-house has ten boilers, but no oven. This want should be supplied. A skylight and louvre should at the same time be placed in the roof.

There is a cleaning-room, part of which, as we were informed, is to be taken off to hold the bath.

There is no drill shed.

A good water supply is laid on to the barracks by contract with the Paisley Water Company.

Part of the surface drainage only is trapped at present. All the gulley grates should have proper traps provided.

The privies are in a very noxious condition. They are drained into a cesspit behind. They should be reconstructed on the principle of Macfarlane's water latrines, and a suitable outlet for the drainage should be found, either into a drain, or by applying the liquid to irrigate land at a sufficient distance from the barrack ; or if an outlet cannot be obtained in one or other of these ways, the contents of the latrine should be flushed out into a water-tight cart, and removed daily, on the plan in use at Glasgow barracks.

The present arrangement of urinals is defective, and proper urinals, supplied with water for cleansing, should be constructed, instead of the present ones.

The ash-pits are not properly constructed. They are sunk below the level, and not being properly drained they accumulate water. To prevent this evil, they should be filled up, and raised a few inches above the level. They should be paved and drained, and the refuse should be removed at short intervals.

The guard-room requires ventilation by one of Mackinnel's or Muir's ventilators in the roof.

The canteen tap-room and the non-commissioned officers' room require Arnott's ventilators into the chimneys, and perforated glass panes for the windows. The tap-room should have a better grate.

The armourers' shop requires more light by a skylight.

Paisley barracks have no married accommodation for either non-commissioned officers or men, and there is no mess-room for non-commissioned officers.

*The following are the Sanitary Improvements required :—*

1. Reduction of the number of men in each room to the extent specified above.

2. Ventilation of each room, and of the library and school-room, by a shaft, inlets, and remodelled grates. Guard-room to have a ventilation in the roof. Canteen tap-room and non-commissioned officers' rooms to have Arnott's ventilators in the chimneys, and perforated panes in the windows.

3. The ablution-room to have more light and ventilation through the roof. A bead to be put to the table. Pegs to be supplied. An additional bath to be put up besides the one authorized.

4. Women's wash-house to have fixed tubs, a grating for the feet, and a drying stove.

5. Cook-house to have a roasting oven put up, and to have a skylight and louvre in the roof.

6. Privies to be drained to an outlet in one of the ways suggested, and to be reconstructed as water latrines on Macfarlane's principle. The urinals to be reconstructed, and supplied with water. Ash-pits to be filled up, paved, and drained, and their contents removed at short intervals.

*Paisley Barracks Hospital.*

The hospital is situated in an angle of the boundary wall. It is one story high, and not sufficiently raised above the ground. It has a verandah in front, and a small enclosed yard behind, but it is not cut off in front from the parade ground.

The accommodation within the buildings consists of a surgery, pack store, serjeants' room, a small ward, and two large end wards. There is besides these an additional ward of wood, and a small itch ward, the whole being connected by a corridor. In the yard behind the hospital are the kitchen, privies, dead-house, wash-house, ash-pit, &c. The present regulation accommodation is for 32 beds, with about 700 cubic feet per bed, disposed as follows :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 9 | 6 | 3 |
| 2 | 2 | 1 | 1 |
| 3 | 9 | 6 | 3 |
| 4 | 12 | 8 | 4 |
| Total - | 32 | 21 | 11 |

By giving a little more than 1,000 cubic feet of space per bed, the wards will hold 21 sick, in the proportions given above, a proportion which ought to be amply sufficient for the force.

If the accommodation in barracks were reduced to 176 men, every man in hospital would have at all ordinary times above 1,200 cubic feet of space.

The amount of accommodation is therefore sufficient, but the excess of beds ought to be at once removed from the wards.

The wards are partially ventilated by openings through the ceiling into the roof. The ventilation could be more under control if a shaft were carried from the ceiling of wards 1, 3, and 4, through the ridge, and if two inlets for air, one on each side the ward, were made close to the ceiling. In the wooden ward, perhaps, the best way would be to convert one of the chimney flues, of which there are two, into a ventilating shaft, by closing the fireplace, and making an opening into the flue close to the ceiling. The other fire-grate should be remodelled. Ward No. 2 may be ventilated by an Arnott's silk flap valve. The corridors should have louvres carried through the roof, to keep up a circulation of air in them.

There is gas in the wards.

There is no bath and no lavatory accommodation Both deficiencies could be easily supplied.

There is no water-closet, but there are defective privies in the yard.

A water-closet should be constructed in connexion with the lavatory and bath-room, and the privies drained and reconstructed on Macfarlane's principle. A proper urinal should also be provided.

The kitchen is insufficiently provided with the means of cooking hospital diets. It requires a new range with a roasting oven ; it also requires ventilation through the roof.

The wash-house and dead-house also require roof ventilation.

There is an ash-pit in the hospital yard, which ought to be removed.

*The following are the Sanitary Improvements for this Hospital :—*

1. Reduction of the number of beds per ward to the extent stated.

2. Ventilation of the wards by shafts and inlets as described. Ventilation of the kitchen, corridors, wash-house, and dead-house, through the roof.

3. A water-closet, a bath, and an ablution table, with hot and cold water, to be provided in connexion with the hospital. Privies in back yard to be reconstructed, and drained on Macfarlane's principle. A urinal to be provided. Ash-pit to be removed out of the hospital yard.

4. Kitchen to be provided with a new cooking range and oven, and to be ventilated through the roof.

## VII. HAMILTON CAVALRY AND INFANTRY BARRACKS.

These barracks are in an open, airy situation at the outskirts of the town of Hamilton. They consist of two divisons, one for cavalry, and the other for infantry. The cavalry barracks were built of stone in 1796, and are in two blocks on opposite sides of the parade ground. The officers' quarters are at right angles to them on the third side. In continuation of the parade ground is an exercising ground, along one side of which there are 26 brick hut barrack-rooms, which were erected in 1855 for the militia. At the end of the enclosure furthest from the cavalry barracks is the hospital. The total area within the barrack boundary is 10 acres 3 roods 24 falls Scotch measure. The subsoil is clay, but the ground is sufficiently elevated to admit of thorough drainage.

Cavalry Barracks.—The soldiers' rooms in the cavalry ranges are over the stables, and access is obtained to them by staircases, some of which are of stone, and others of wood. Behind each staircase is a projecting block of building, containing cook-houses and ablution-rooms down stairs, and the serjeants' mess, shops, &c. in the floors above.

At the top of the staircase is a long central passage or corridor, extending the whole length of each block, out of which the barrack-rooms open right and left. This passage is well provided with ventilating skylights, and it is light and airy, in comparison with similar passages in other cavalry barracks. It has besides, a window at the end. Opposite the top of the staircase is a space with a window, which at a trifling cost might be fitted up as a day-room.

The doors of the rooms are close to the fireplaces. This arrangement could be advantageously changed by shifting the door to the opposite end of the room. The windows are partly of a new and partly of an old form. The older windows have sliding sashes, and are in the back ranges of rooms. The front rooms have windows with sashes to lift up and draw down ; and the rooms where these windows have been introduced are much lighter and more airy than the others.

In the two ranges of cavalry barracks there are 17 soldiers' rooms, with regulation space for 136 men at about 515 cubic feet per man.

The following table shows the accommodation :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 17 | 136 | 119 | 17 |

The present number of men per room is eight. If it were reduced to seven each man would have a little less than 600 cubic feet.

Each room is supplied with two ventilators in the ceiling, connected with shafts which go above the roof. There are also sliding windows over the doors into the passage.

All that is required in the way of improvement in ventilation is to introduce an inlet of the usual construction in the outer wall, close to the ceiling of each room, and to reset the present grates so as to warm part of the air admitted in winter.

The end window of the passage should have a pane or two of perforated zinc, to admit fresh air.

The serjeants' quarters are at the end of each block. They are provided with Arnott's ventilators in the chimney. The serjeants' mess, which is situated in one of the projecting blocks upstairs, has no mess kitchen.

The saddlers' and shoemakers' shops are in a projecting building. They should have an Arnott's ventilator in the chimney.

In another of the projecting buildings is the school-room. It has some ventilation in the ceiling, and it is warmed by two grates. One of them should be remodelled, to warm part of the air admitted, and the other should have its chimney converted into a ventilating shaft, by an opening made into the flue close to the ceiling. Two inlets for air should also be provided.

The library is in a soldiers' room. Its grate should be reset in the same way as that recommended for the other rooms.

Gas is laid on to the barracks.

The ablution-rooms are on the ground floor of the projecting buildings. They are sufficiently provided with requisites, except baths. One bath would be sufficient for the cavalry barrack.

Water is obtained from the town supply. It appears to be sufficient.

There are two cook-houses with boilers, but they have no ovens. One oven is authorized to be put up.

There is a women's wash-house in a detached building. It has a small louvre in the roof, which is insufficient for ventilation. It has no fixed tubs, no gratings to stand on, and no drying stove. All these desiderata ought to be supplied.

The building itself is large enough for the cavalry barracks, but not for the infantry barracks.

The riding-school is well lighted, but it requires ventilation in the roof by raised ridge-tiles or by two louvres.

The women's privy is near the riding school, and has a cesspit close to and combined with the ash-pit. This privy should be converted into a water latrine, and provided with drainage, and the ash-pit should be abolished. The other ash-pits are too large; they should be raised and paved; and the dung-pits should be similarly improved.

There are two sets of men's privies, one on each side the exercising ground. One set is drained and constructed on Macfarlane's principle, with small divisions between the seats, and the buildings have light and ventilation by a barred window. The other set is of the ordinary construction, and is drained into the adjoining manure pits. These privies should be remodelled on Macfarlane's principle, and drained like the others.

The canteen is tolerably good, but it is too small when the infantry barracks are occupied. The tap-room and the serjeants' room require Arnott's ventilators in the chimney, and a perforated pane in each window.

The guard-room requires ventilation by means of one of Muir's four-point ventilators about one foot square. The grate should be remodelled to warm part of the air admitted.

Each cell should have a shaft six inches square in the ceiling, and warmed air should be admitted from the back of the guard-room grate.

INFANTRY BARRACKS.—The infantry barracks are in a long one-story brick building, erected against the enclosure wall, and have windows on one side only.

Each room has two fireplaces, one at either end, and four windows, two on each side of the door. The door is protected by a small wooden porch inside the room.

There are altogether 14 rooms, with regulation accommodation for 26 men each, with about 337 cubic feet per man.

The following table shows what the accommodation would be at 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 14 | 364 | 210 | 154 |

Each room ought to contain 15 men instead of 26.

Each room has an Arnott's ventilator, opening into a flue separate from the chimney, there being one of these extra flues between every two rooms. The amount of outlet so obtained is not sufficient, but it could easily be increased. One grate in each room should be remodelled, to warm the air admitted, the other should be closed up, and the chimney converted into a shaft for the removal of foul air, by making an opening into the flue close to the ceiling. The Arnott's ventilator should at the same time be removed from the opening into the present shaft.

The openings into these shafts should be double the sectional area of the flue, and each should be covered with a grating.

Two inlets for fresh air should be made in the outer walls close to the ceiling. One of these should, if possible, be on each of the opposite sides of the room, but not opposite each other. If the boundary wall does not admit of openings being made in it, both the inlets should be made in the front wall over the windows.

The ablution-room of these barracks is tolerably good. Water is laid on to a cistern; the ablution tables are of wood, and there are gratings to stand on, and pegs, but no baths. Three baths with water laid on would be required for the infantry barracks.

The cook-house is tolerably good. There are boilers of the old pattern placed in the middle of the floor. There is a louvre in the roof, which affords sufficient ventilation. There is no oven; one should be put up.

The privies empty into a cesspit, which should be abolished, and they should be reconstructed on Macfarlane's principle, and properly drained.

The guard-room for these barracks should have the grate remodelled, to warm part of the air admitted.

*The following are the Sanitary Improvements required for Hamilton Barracks :—*

1. Numbers of men in each cavalry barrack-room to be reduced from eight to seven men per room, and in the infantry barracks from 26 to 15 men per room.

2. Rooms in the cavalry barrack to have each one inlet for air, and a reset grate. End windows in the passages to have perforated glass panes. Saddlers' and shoemakers' shops to have Arnott's ventilators. School-room ventilation to be improved by converting one of the chimney flues into a ventilating shaft, as described. Two inlets for air and a remodelled grate to be provided. Library to be ventilated like

the barrack-rooms. Doors in the cavalry barracks to be removed to the end of the room furthest from the fire.

Infantry barracks to have two inlets for fresh air. One chimney to be closed, and the flue converted into a foul-air shaft, as described. The other fireplace to be remodelled. Arnott's ventilators to be removed from the existing shafts.

3. Ablution-rooms in both barracks to be provided with baths.

4. Infantry cook-house to have an oven.

5. Women's wash-house to be enlarged, to be better ventilated, and to have fixed tubs, water, gratings, and a drying and laundry store.

6. Riding school to be ventilated through the ridge of the roof.

7. All the privies within the barrack boundary to be drained, and reconstructed on Macfarlane's principle, and the cesspits to be abolished. The ash-pits and dungheaps to be raised a a little above the level of the surface, and to be paved and drained.

8. Canteen tap-room and non-commissioned officers' rooms to have Arnott's ventilators, and perforated glass panes for ventilation.

9. Cavalry guard-room to have a Muir's ventilator in the roof, and a remodelled grate, to warm the air in the guard-room and cells. Each cell to have an outlet shaft through the roof. Infantry guard-room to have a remodelled grate.

*Hamilton Barracks Hospital.*

This hospital is situated at the end of the exercising ground near the entrance. It has a small enclosed yard behind, but no enclosure in front for convalescents, although there is plenty of space available for the purpose. The building is of two stories, with a good central stair and passage going through and through the house.

On the ground floor there is a ward on one side of the passage and a serjeants' room, and the surgery on the other side. Upstairs there is a ward on one side the staircase, and a store-room and small ward on the other; the small ward is used as a pack store. The kitchen is in a one-story projecting building behind, and in the back yard are the dead-house, wash-house, privies, cesspit, &c.

The total present regulation accommodation is for 21 beds, with from 516 to 713 cubic feet each.

The following table shows the number of beds in each ward contrasted with what it should be at about 1,200 cubic feet per bed :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 9 | 6 | 3 |
| 2 | 9 | 6 | 3 |
| 3 | 3 | 1 | 2 |
| Total - | 21 | 13 | 8 |

Wards No. 1 and 2 will at the outside hold six beds each, giving considerably less than 1,200 cubic feet per bed. Ward No. 3, which is intended for serious cases, ought not to have more than one such case in it.

This hospital requires to be extended, to make it more commensurate with the requirements of the force, and there is plenty of space for the purpose.

The larger wards have a certain amount of ventilation through the ceiling; the lower ones by means of a hollow beam, and the upper ones by openings into the roof. An outlet shaft should be carried up from the ceiling of each ward to above the roof. The hollow beam in the lower ward should be converted into an inlet for air, by placing louvres at the side, arranged to throw the current up to the ceiling In the upper wards an inlet should be made on each side the ward. The fire-grates should be remodelled, to warm part of the admitted air.

Ward No. 3 is not ventilated. It requires an Arnott's valve and one inlet. Additional ventilation should be given to the staircase by panes of perforated glass in the windows.

The kitchen has an oven, an ordinary range, and two boilers. They are considered sufficient for cooking the diets.

The dead-house has no skylight nor ventilation, no proper table nor drainage, and it is used as a bath-room, on account of their being no ablution nor bathing accommodation in the hospital.

There is no water-closet connected with the building. There is a privy for the use of the sick in the yard. It empties into the ash-pit, which is in fact an open cesspit. It is offensive, and should be abolished at once; the privies being remodelled on Macfarlane's principle, and drainage provided.

The readiest way of supplying the defects stated above would be to add a story to the kitchen, and in the space so obtained to construct a water-closet, a bath-room with a bath, and hot and cold water laid on, and to put up a Macfarlane's ablution table. Access should be provided to these conveniences from the staircase.

A proper exercising ground for convalescents, with seats, is required.

*The following are the Sanitary Improvements required for this Building :—*

1. The extension of the ward space, and reduction of the number of beds in the present wards to the amount stated.

2. Ventilation of the wards by shafts, inlets, and remodelled grates, and by an Arnott's ventilator and inlet for the small ward as described. Ventilation of the staircase by perforated panes. Ventilation of the dead-house.

3. Space to be obtained over the kitchen for a bath-room, ablution-room, and water-closet. Privies in the yard to be drained, and reconstructed as water latrines. Cesspit to be abolished, and the ash-pit removed.

4. An exercising ground for convalescents to be provided.

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## VIII. DUMBARTON CASTLE.

Dumbarton Castle contains two sets of barrack-rooms and a hospital. One of the barracks is situated between the summits of the rock on the western side, and is freely exposed to the winds. The other set of rooms is in the two lower flats of what was formerly the governor's house; and the upper flats of the house, which have a separate entrance behind, are appropriated as officers' quarters. These rooms are near the entrance gate, and face the south. The almost vertical walls of the rock rise directly behind them. A little higher up on the same side is a small house which has been used as a hospital since 1856. The space occupied by all the buildings is narrow and confined, on account of the nature of the ground, but the position is a healthy one.

The barrack accommodation is not very good. That in the upper barracks is the best. These barracks are open at both sides to the air, while the lower barracks are freely exposed only on one side.

There are six rooms in the upper barrack, with regulation space for 12 men each, with from 328 to 367 cubic feet per man; and the lower barrack contains seven six-men rooms, with from 370 to 400 cubic feet per man.

The following table shows the accommodation in

each room, in comparison with what it would be at nearly 600 cubic feet per man :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Upper Barrack: | | | |
| 1 - - - | 12 | 8 | 4 |
| 2 - - - | 12 | 8 | 4 |
| 3 - - - | 12 | 8 | 4 |
| 4 - - - | 12 | 8 | 4 |
| 5 - - - | 12 | 7 | 5 |
| 6 - - - | 12 | 7 | 5 |
| Lower Barrack: | | | |
| 1 - - - | 6 | 4 | 2 |
| 2 - - - | 6 | 4 | 2 |
| 3 - - - | 6 | 4 | 2 |
| 4 - - - | 6 | 4 | 2 |
| 5 - - - | 6 | 4 | 2 |
| 6 - - - | 6 | 4 | 2 |
| 7 - - - | 6 | 4 | 2 |
| Total - - | 114 | 74 | 40 |

The rooms are at present considerably overcrowded ; but, owing to the exposed position of the buildings, it is not necessary to give the full allowance of 600 cubic feet per man in these rooms. We have, therefore, in the above table required less than the full amount ; but the numbers per room which we have laid down are the maximum numbers the rooms ought to contain.

Should it be considered necessary to keep up the full complement of 114 men, it would be possible to extend the accommodation on the higher level.

None of the rooms are ventilated. They each require a shaft carried up from the ceiling to above the roof, an inlet for air, and a remodelled grate to heat part of the inflowing air in winter. We consider these remodelled grates as being essential parts of the ventilating arrangements in so exposed a position ; and we would advise their being put up at the same time as the shafts and inlets.

The attic rooms in the upper barracks are very close, and might be improved by carrying the ceiling in the line of the roof to give more space overhead. The staircase in these barracks also requires ventilation by perforated glass panes, and by a shaft carried up through the top ceiling to above the roof. Several barrack-room windows do not open at top. All should be made to do so.

Each non-commissioned officer's room should have an Arnott's ventilator put into the chimney.

The rooms are lighted with candles. There is gas laid on at no great distance from the castle, and it should be introduced into the rooms.

There is no ablution-room at the upper barrack. At the lower barrack there is a room, the back wall of which is the rock ; this room is used as an ablution-room and women's wash-house. It is very dark, but might be improved and converted into a proper ablution-room, with one bath, which would be sufficient bath accommodation for the whole barracks. An ablution-room is required for the upper barrack. There are two cook-houses, with boilers, but without ovens. A ventilated roasting oven is required for each.

The water supply is derived from the rainfall on the roofs, which is collected in underground tanks. The amount of water obtained in this way is quite insufficient for supplying the garrison. Indeed, during two months of the present year all the water had to be obtained from the wells in Dumbarton, and carted to the Castle.

It has been stated to us that the town of Dumbarton is being supplied with water by gravitation from the neighbouring hills, and when this supply has been obtained it should be conducted to the castle.

The means of drainage for all the barracks are ample, but the privies are notwithstanding in a noxious condition, and the accommodation is not sufficient for the force. When a sufficiency of water is laid on we would advise that all of them should be enlarged and reconstructed as water latrines on Macfarlane's principle, and drained into the river Clyde. Proper urinals should also be put up.

The guard-room requires ventilation and warming by a shaft and remodelled grate. There is a cell under the barrack-rooms of the upper barrack totally unfit for human occupation. It appears to be little if at all used, and should be struck off the construction.

The guard-room should have better means of warming and ventilation.

*The Sanitary Improvements required for Dumbarton Castle are as follows :—*

1. Reduction of the number of men in each barrack-room to the extent shown in the table.
2. Ventilation of the rooms by shafts, inlets, and remodelled grates. Ventilation of the upper barrack staircase by a shaft and perforated panes. Lower barrack staircase to have perforated panes in the windows. Non-commissioned officers' rooms to have Arnott's ventilators in the chimneys. Guard-room to have a shaft and remodelled grate. All windows to be made to open at top.
3. A ventilated gas-burner to be introduced into each barrack-room.
4. An ablution-room, with tables, basins, &c., to be provided for the upper barrack. The ablution room in the lower barrack to be properly walled, lighted, and fitted up, and one bath with water laid on to be provided.
5. Cook-houses to be provided with a roasting oven each, and to be properly ventilated.
6. Town water to be introduced as soon as possible.
7. All the privies to be reconstructed as water latrines on Macfarlane's principle, with proper divisions, half-doors, light, and ventilation, and drained. Urinals to be reconstructed and supplied with water.

*Dumbarton Castle Hospital.*

As already stated, this hospital is a small house on the south side of the Castle rock near its base. The building was not originally intended for a hospital, and affords little else than a certain amount of house room for sick. It is two stories high, and contains four wards, a small kitchen, and a surgery seven feet long by three feet wide. There is no accommodation for orderlies, and there is no hospital serjeant's room, a ward being misappropriated for the serjeant's use.

The wards are all of a size, namely, 14 feet long, 10 feet 6 inches broad, and 9 feet high. The total accommodation is for 12 beds, with 332 cubic feet per bed, being the smallest amount of space allowed in any hospital we have visited. The following is the accommodation per ward :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | Hospital / Serjeant | — | — |
| 2 | 4 | 1 | 3 |
| 3 | 4 | 1 | 3 |
| 4 | 4 | 1 | 3 |
| Total - | 12 | 3 | 9 |

Each of the wards should contain one bed and no more. There is no ventilation, but, with one bed per

ward, this defect could be sufficiently remedied by an Arnott's silk flap ventilator placed in each ward chimney, and by a Sherringham's ventilator through the wall, close to the ceiling.

There are no means of bathing, and there is no ablution-room.

There is no hospital wash-house.

The kitchen is imperfectly supplied with the means of cooking, and requires a range, with an oven.

There is no water-closet, and patients have to make use of an open privy over the river.

There is no storeage of any kind. If sick are to be treated within the precincts of the castle some more suitable provision should be made for them. There is very little level ground on which to extend the buildings, but some further accommodation might be obtained in the way of extension. In such a case all that can be done is to make the most of what facilities there may be available, and to trust to ventilation for keeping the wards healthy.

We would recommend :—

1. That it be considered to what extent the ward space could be enlarged by additions to the building.

2. That the present wards be ventilated by Arnott's ventilators, and by a Sherringham's ventilator in each, and that a window be opened in the back wall of each ward. That the stair be ventilated by a shaft through the roof, and that perforated panes be put into the passage and stair windows.

3. That an oven be added to the kitchen.

4. That the present privies be converted into water latrines.

Lastly. That it be considered whether in the event of an extension of the hospital being carried out, accommodation, however limited, might not be found for an ablution table and bath, and for the hospital serjeant.

## IX. FORT AUGUSTUS.

This fort is situated on an angle of land, bounded on the north side by the waters of Loch Ness, and on the west side by the Caledonian Canal. The position is low when compared with the surrounding country, but it is freely exposed to the winds, and ought to be healthy.

The barrack buildings are placed in the square of the fort, and consist of four blocks, with the parade ground between them. They are two stories high, with an attic above. Three of the blocks are appropriated as men's rooms, the hospital, &c., and the fourth for officers' quarters, &c. There are 18 men's rooms and 10 attics, with regulation accommodation for 166 men, with from 433 to 497 cubic feet per man, arranged as follows :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| No. 1 House, 8 rooms, (Nos. 1 to 8) | 56 | 48 | 8 |
| Attics, (Nos. 1, 2, 3, 4) | 16 | 12 | 4 |
| No. 2 House, Rooms Nos. 1 and 2 | 14 | 12 | 2 |
| Attics Nos. 1 and 2 | 8 | 6 | 2 |
| No. 3 House, 8 rooms, (Nos. 1 to 8) | 56 | 48 | 8 |
| Attics, (Nos. 1, 2, 3, 4) | 16 | 12 | 4 |
| Total - - | 166 | 138 | 28 |

By the present construction each barrack-room has seven men, and each attic room four men. By removing one man out of each room and attic, the remaining men will have less than 600 cubic feet per man, but the space afforded would be sufficient in so airy a situation.

The men's rooms are of old construction. They are placed back to back, and have only one small window each. With three exceptions the floors are of brick. They are entered from central passages and stone staircases. The passages are paved with cobble stones. The whole barrack is out of repair. It is worthy of consideration whether it is necessary to retain it for public uses ; if so, the buildings should be put in a tenantable and healthy condition. The passages should be flagged, and all the rooms properly floored and otherwise improved. None of the rooms are ventilated, and each room should have a shaft and inlet of the usual construction. The fire-grates are very old and wasteful. In such a climate remodelled grates would be specially useful.

These barracks were built 125 years ago, and we have been informed that no improvements have been made in them since that date.

They are destitute of the most ordinary conveniences.

There are no store-rooms, school-room, day-room, nor library. There are no lavatories, baths, nor wash-houses.

There is no kitchen or cook-house, and all the cooking has to be done with pots on the barrack-room fires.

There is no cleaning-room, drill-shed, nor workshop, and there is no accommodation for married non-commissioned officers nor soldiers.

Water is obtained from wells. It is stated to be good, and, from the local position of the fort, it could be increased to any required extent.

The privies are placed round a central shaft at one angle of the fort, and are drained into Loch Ness. If it be determined to retain the fort, these privies should be reconstructed as water latrines on Macfarlane's principle, and urinals should be attached to them. The whole of the fort drainage should be at the same time examined and revised.

The guard-room is dark and unventilated.

*Hospital, Fort Augustus.*

The hospital consists of five rooms, two downstairs, and three upstairs in an attic, all in a dilapidated state. The downstairs rooms have brick floors.

There is no accommodation for sick except these rooms. There is neither kitchen, surgery, serjeants' room, ablution-room, bath, nor water-closet. In fact, there is nothing of a hospital except the name.

Fort Augustus is not fit for occupation in its present state, and we do not think it necessary to make any specific recommendations regarding it.

The whole construction should be at once revised, if the buildings are to be retained ; and in revising the construction, the sanitary defects we have mentioned above should be removed.

## X. ABERDEEN BARRACKS.

There are two barracks at Aberdeen ; one for infantry, situated within the town, and the other in a small fort on the sea shore.

### 1. Infantry Barracks.

These barracks are situated at the eastern extremity of the city of Aberdeen, on an elevated plateau of gravel 2 A. and 30 P. in extent ; the buildings are arranged in the form of a letter E, of which the central block is composed of officers' quarters. In front the barracks overlook the port, but behind and close to the buildings is a neighbourhood of inferior houses, densely populated. The site is lofty and exposed to the sea breeze, and ought to be healthy.

The men's rooms are in three floors over a deep basement, which is used for cook-houses, ablution-rooms, &c.

On each floor two barrack-rooms open out on either

side of the central passage and staircase. The rooms are back to back, with the fireplace at the end opposite the door. There are circular openings between the rooms, and a circular opening from every room into the staircase and passage. The rooms are all of one size, namely, 25 feet 3 inches long, 20 feet wide, and 9 feet 3 inches high. None of them have more than two windows, and each room has regulation space for 12 men, with 390 cubic feet per man.

The following table shows the present regulation accommodation in comparison with what it could be at 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation for 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| No. 1 Barrack, 10 rooms - | 120 | 80 | 40 |
| No. 2 Barrack, 12 rooms - | 144 | 96 | 48 |
| No. 3 Barrack, 12 rooms - | 144 | 96 | 48 |
| No. 4 Barrack, 12 rooms - | 144 | 96 | 48 |
| Total - | 552 | 368 | 184 |

If all the barrack-rooms were occupied by troops they would, according to present regulation, hold 552 men in a space sufficient only for 368 men, showing an excess of 184 men, or 50 per cent.; but it appears that 13 of those rooms are used for school-rooms, library, serjeants' quarters, staff quarters, stores, &c., so that the available space for men consists of 33 rooms, accommodating, according to existing regulation, 396 men in a space sufficient for 264 men, at less than 600 cubic feet per man. This overcrowding is in no way compensated for, either by the structure or present ventilation of the barrack; but we consider that with proper ventilating arrangements each room may in so airy a position be set apart for 8 men, instead of 12, the present number.

Most of the rooms have Arnott's ventilators, but they are not sufficient to renew the air, and they have been closed to prevent smoke. The windows slide sideways, a form of construction not well adapted for ventilation. The fire-grates are of the old pattern. Five of the rooms have berths for serjeants. All the rooms have cupboards. All require to be properly ventilated by shafts and remodelled grates to warm the air admitted, and the existing openings through the partition walls between the rooms should be closed. It would be very advisable to provide one inlet for fresh air for each room close to the ceiling, over the window, provided an inlet could be easily made, but if not, the openings into the passages and stairs might be used as inlets, provided a board were placed over them to throw the inflowing air current up towards the ceiling. The upper panes of the passage and staircase windows should be formed of perforated glass, which would complete the ventilation of the stairs. Outlet shafts from the top of the stairs through the roof already exist.

All the barrack-rooms have gas.

The ablution-room is in the basement. The floor of it is of stone, sloped towards a gutter in the centre, and there are benches at the sides. The tables have no beads. Water is laid on. There are gratings to stand on. There are no pegs, and no baths.

These deficiencies ought to be supplied. If *all* the barrack-rooms were occupied at eight men per room, as recommended above, four baths with water laid on would be required.

The cook-houses are in the basement; they are tolerably light, and have brick ovens, recently erected. The boilers are of the ordinary pattern.

Neither cook-houses nor ablution-rooms are ventilated; and, as they are under men's rooms, shafts a foot square should be carried up from them to above the roof.

The serjeant's mess is in a soldier's room; it requires an Arnott's ventilator. There is no mess kitchen.

The women's wash-house is in the basement; it is dark, but might be improved in this respect by a Chappuis' reflector against the windows. It has no fixed tubs, and no drying nor laundry stove, and is too small. It would be much better to remove the wash-house from its present position altogether, and to reconstruct it, with the necessary implements, outside the barrack buildings.

The library is a barrack-room allotted to the purpose; it is also used as a reading room and lecture room for instruction in musketry. It has an Arnott's ventilator, but requires the same kind of ventilation as the barrack-rooms.

The school-room also requires to be ventilated in the same manner.

There is no infant school-room in the barracks, a hired room outside being used for the purpose.

The privies are of the ordinary construction, but the soil falls into a deep receptacle, from which it is flushed out into the drains. There is neither light nor ventilation to the buildings except by the door. They should be reconstructed with a shallow receptacle, on Macfarlane's principle, in which water should stand always, and with divisions of seats, half-doors, adequate light, and ventilation through the roof.

The ash-pit is too large; it has no cover. The ashes are thrown in through a square opening in a wall.

It should either be abolished, and a cart substituted; or, if this be impracticable, the ash-pit should be filled up above the level of the ground, and the surface paved and drained. It should be covered over, and a hopper and sliding door fitted to it. Another large ash-pit near the stable should be abolished altogether. It is quite unnecessary.

The stable has, it is stated, been condemned. It is in a confined situation, but the building, if properly repaired and adapted, might be used for a serjeants' mess and mess kitchen.

The canteen is a small defective building in a corner behind the barrack. The tap-room, and non-commissioned officers' room, which is partitioned off from the tap-room, require an Arnott's ventilator to improve the ventilation. The guard-room is under one end of the west wing of the barracks. It requires a shaft for ventilation, and the grate to be remodelled to warm the air admitted. It has a urinal, but no latrine. Additional light is also required.

The cells are ventilated and warmed by a stove in the passage. There is no cook-house, no latrine, and no quarters for the provost serjeant.

This barrack is deficient in many points, and these deficiencies have to be supplied by misappropriating a number of men's rooms, and overcrowding the remainder. It is unsuited for a depôt battalion, and only fit for a four company depôt in its present condition. It has been proposed to extend it on ground which, we are informed, could be obtained on the west side.

The following are the sanitary improvements required for the present buildings :—

1. Reduction of the regulation number of men from 12 men to 8 men per room.

2. Ventilating every barrack-room by a shaft carried from the ceiling to above the roof, and, if possible, by an inlet near the ceiling of each room, or by converting the opening from the staircase into an inlet as described. The grates to be remodelled to warm part of the admitted air. Circular openings in the partition wall between the rooms to be closed. Additional ventilation to be given to the staircase by perforated glass panes in the windows. Serjeants'

mess to have an Arnott's ventilator. Library and school-room to be ventilated like the barrack-rooms.

3. Ablution-rooms to have beads to the tables, pegs, and four baths ; and to have shafts carried up through the roof for ventilation.

4. Cook-houses to have shafts carried up from the ceiling to above the roof.

5. Women's wash-house, if possible, to be removed, and reconstructed out of the barrack buildings, or to be improved as suggested.

6. Privies to be reconstructed as water latrines, on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation. Proper urinals, supplied with water, to be constructed at the same time.

7. Ash-pit near the stable to be abolished. The other ash-pit to be removed if possible, or to be filled up, paved, drained, and covered in as described.

8. Canteen tap-room to be ventilated by Arnott's ventilators.

9. Guard-room to be ventilated by a shaft and remodelled grate,

*Aberdeen Barrack Hospital.*

This building is situated within an enclosure, separate from the barrack, and divided from it by a public street. It is open and airy to the front, but the back is bounded by a close neighbourhood of unhealthy houses, and by an offensive lane, in which are stables for horses and cattle, the ground in front of which was covered with manure heaps at the time of our inspection.

These nuisances ought to be abated, as no doubt they can be by enforcing the law.

The hospital has two stories and a basement, which, on account of the slope of the ground, is open to the back.

The surgery and pack and provision store are placed in the basement on one side, and on the other side are the serjeants' room and kitchen. A central passage and staircase of stone, with wooden landings, divides the building into two parts. There are two water-closets downstairs at the back of the passage, and two over them on the half landing. The two upper water-closets require ventilation by a shaft and perforated panes in the side windows. On the ground floor and first floor there is a ward on each side of the central passage.

This hospital contains several good points of construction well suited for regimental purposes. It has four wards, all of equal size, and arranged symmetrically on each side of the staircase. There are three windows on each of the opposite sides, with the beds ranged between them, but there are no orderlies' rooms, and the attendants have to sleep among the sick. This defect, however, is not inherent in the plan.

There are in all four wards, with regulation space for 40 sick, with from 626 to 766 cubic feet per bed. The following table shows the details of this :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Bed Spaces. |
|---|---|---|---|
| 1 | 10 | 7 | 3 |
| 2 | 10 | 6 | 4 |
| 3 | 10 | 5 | 5 |
| 4 | 10 | 6 | 4 |
| Total - | 40 | 24 | 16 |

In order to accommodate 24 sick in the proportion per ward given above it will be necessary to allow considerably less than 1,200 cubic feet per bed. But 24 beds is the maximum number these wards ought to contain.

Each ward has a chimney shaft at either end. All the windows open at the bottom, but some do not open at the top ; this should be remedied. One of the chimney shafts should, if possible, be changed into an outlet foul-air shaft, by closing the fireplace, and making an opening near the ceiling into the shaft of double its sectional area. The opening should be covered with a grating. If this cannot be done, a shaft should be provided through the roof at one end of the room, as recommended for the barrack-rooms. The grate should be remodelled to warm the air admitted.

In the lower wards there are hollow beams with openings at each side. These beams would make good inlets for fresh air if the sides were fitted with louvres sloped upwards to throw the air entering up towards the ceiling. The upper wards have openings in the ceiling into the roof. From one of these openings a shaft should be carried above the roof, and the others should be closed. Each of these upper wards should have two inlets for air, one on each of the opposite sides, close to the ceiling. The wards are lighted with gas, but the burners are not ventilated. The central staircase should have a louvre through the roof for ventilation.

The kitchen is under a ward. It requires ventilalation by a shaft and perforated panes of glass in the windows. It is provided with an oven.

There is an ash-pit in the yard, in a position where it is not required. It should be abolished, and means should be provided for the daily removal of refuse.

The wash-house has no fixed tubs, no gratings, and no means of drying linen. It has a louvre in the roof.

There are no privies in the back yard. There is no bath or ablution room. Space for these might be obtained by removing the two lower water-closets, but to enable this to be done a water latrine would have to be constructed in the yard. In the front part of the hospital there is a shed for exercise.

Water is derived from the town supply, and is abundant and good.

This hospital is not sufficiently extensive for a recruiting depôt. Besides the deficiencies mentioned above, it has no provision nor pack store. It has no room for examining recruits, and there is no itch ward, with a suitable bath, although many recruits arrive at the station suffering from this disease. In fact, it requires to be enlarged to make it sufficient for the wants of the station.

In so far as concerns the present buildings, *the following are the sanitary improvements requisite* :—

1. Reduction of the number of beds per ward to the extent stated.

2. Ventilation of the wards by shafts, inlets, and remodelled grates. All the ward windows to be made to open at top. Ventilation of the staircase by a louvre through the roof. Ventilation of the kitchen by a shaft and perforated glass panes.

3. Ash-pit in the yard to be removed.

4. Wash-house to be fitted up.

5. Upper water-closets to be ventilated by shafts and perforated panes.

6. A bath room with one bath, and an ablution table, both with hot and cold water laid on, to be provided.

7. Gas-burners, to be ventilated by funnels and tubes into the chimney.

2. The Fort.

The Fort is about half a mile from the barracks. It is placed a little above the sea beach, and commands the entrance to the harbour. It contains two rooms similar in construction, one at each end, and is intended to accommodate 40 men. The rooms have small ventilators near the ceiling, capable of being closed ; these should be altered to inlets like Sherringham's, and should be always open or grated. The fire-grates should be remodelled to warm the air admitted ; the loopholes should have perforated glass panes ; and perforated glass should be placed in the lobby door.

The ablution-room is not properly fitted up, and has no bath.

The privy empties into a cesspit. A repectacle on Macfarlane's principle should be made, with provision for the daily removal of the refuse, or for discharging it through a drain into the sea. No cesspit should be permitted in such a locality.

There is no guard-room; the master gunner's room is used for one.

This fort was not quite finished when we inspected it. In so open and airy a situation, and with so small a number of men, we should not advise much outlay, except what is absolutely necessary. The following improvements will be sufficient:—

1. Giving the men on all ordinary occasions, as nearly as may be 600 cubic feet per man.

2. Improving the ventilation by having the inlets permanently open, by Arnott's chimney ventilators, and by perforated panes in the windows. Fire-grates to be remodelled.

3. Cesspit to be abolished, and the privy to be reconstructed as a water latrine, on Macfarlane's principle, and drained to the sea, or its contents removed daily by a cart, as is done at Glasgow.

## XI. DUNDEE BARRACKS.

These barracks are situated on a hill, on the north side of Dundee, at a considerable elevation, and about a mile from the River Tay. They stand within an enclosure five and a half acres in extent, and are completely isolated from the buildings of the town. They resemble in structure an old Scottish mansion-house with turrets at the angles. The buildings occupy two sides of a square. They were erected in the year 1760, except the officers' quarters and hospital, which were erected in 1796 and 1797. The buildings are four stories in height, with a basement, and they are all of stone.

The men's rooms are in two sets, one of which is reached by a hanging stair, the other by a spiral staircase. There are 11 rooms occupied by soldiers, and the total present regulation accommodation is for 299 men, disposed as follows:—

| Rooms. | Present Regulation Number of Men. | Number of Men at 1,200 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 29 | 20 | 9 |
| 2 | 28 | 16 | 12 |
| 3 | 36 | 22 | 14 |
| 4 | 31 | 16 | 15 |
| 5 | 28 | 13 | 15 |
| 6 | 34 | 23 | 11 |
| 7 | 28 | 16 | 12 |
| 8 | 38 | 20 | 18 |
| 9 | 27 | 17 | 10 |
| 10 | 8 | 8 | — |
| 11 | 12 | 3 | 4 |
| Total | 299 | 179 | 120 |

It will be seen from this table that the rooms are considerably overcrowded. One of them gives no more than 296 cubic feet per man, and all the others, except two, give under 400 cubic feet.

In one small eight-men room only is the space a little above 600 cubic feet. It is stated to us that the rooms are hardly ever occupied up to the regulation number. It would be better, however, to prevent overcrowding by reducing the numbers on the construction than to trust to such a contingency. Considering the exposed position of the barrack we have in the preceding table allotted less than 600 cubic feet per man, and 179 men is the largest number for which there is healthy accommodation in the rooms.

The rooms vary from 45 to 60 feet in length, and from 23 to 26 feet in breadth, and their height varies from 7 feet 8 inches to 8 feet 2 and 9 feet 8 inches. All the rooms, except one or two, have windows on opposite sides, varying in number from four to eleven per room. None of them have any means of ventilation, but these could be readily afforded in the following manner:—All the rooms, except Nos. 10 and 11, have a fireplace at each end, one of which could easily be dispensed with if the fire-grate of the other were remodelled to warm the fresh air admitted to the room. The other fireplace should then be built up, and the chimney shaft belonging to it might be made into a foul-air shaft, by simply making an opening into it double the sectional area of the flue, close to the ceiling. Rooms 10 and 11 would require ventilating shafts carried up from the ceiling to above the roof. Each room, except Nos. 10 and 11, would require four inlets for fresh air close to the ceiling, two on each side. These two rooms would each require one inlet. The staircases should be ventilated by inserting panes of perforated glass in the windows.

All the rooms are lighted with gas, but none of the burners are ventilated. Each burner should be provided with a proper ventilating funnel and tube into the chimney.

Out of each room, at one angle, a small turret-room opens. These are used as serjeants' quarters, for which some of them are not well adapted. Two or three of the smaller of these rooms would afford space for the erection of carefully-constructed water-urinals, on the plan on trial in the Wellington Barracks, and the urine tubs might be at once dispensed with.

The serjeants' rooms should have Arnott's ventilators put into the chimneys.

There is a library and a school-room. Both require ventilation by a shaft and inlets for air.

There is an ablution-room in the basement, furnished with slate tables, with beads and gratings, but there are no pegs, and no baths. Two baths, with water laid on, would be required for the reduced strength given in the preceding table. There is a small room opening out of the ablution-room, in which these baths might be placed.

Behind the barrack ranges there is an excellent detached cook-house, with eight boilers; but there are no other means of cooking. An oven is required.

The women's wash-house is also in a large detached building. It is deficient in means of washing and drying linen, and requires fixed tubs with water laid on, gratings for the feet, a drying and laundry stove, and a louvre in the roof for ventilation.

There is a sufficient water supply derived from the Dundee waterworks.

The natural facilities for drainage are ample; the existing sewers and drains are stated to be efficient, and all are trapped.

There are four privies in rear of the barracks, with ash-pits attached, into which they are drained. The whole arrangement is offensive and noxious, and should be discontinued as speedily as possible. The privies should be reconstructed as water latrines on Macfarlane's principle, with divisions, half-doors, light, and ventilation, and they should be properly drained. The ash-pits should be filled up to the level of the ground; one only should be retained for use. It should be paved, drained, and covered, and arrangements should be made for more frequent removal of the dust and ashes.

While the privies are being reconstructed, the urinals should be supplied with water for cleansing them.

The canteen is situated on the upper side of the parade ground. It is an indifferent building, and the keeper has no proper accommodation. There is no fireplace in the non-commissioned officers' room. The tap-room requires an Arnott's ventilator.

The guard-room requires ventilation through the ridge by a ventilator on Mackinnel's or Muir's principle. Behind the guard-room are the cells, which are warmed by the iron back of the guard-room firegrate. It will be necessary to remodel this firegrate to warm the air admitted to the guard-room, and in so doing part of the warmed air should be allowed to enter the cells.

Attached to the guard-room is a privy, ash-pit, and urinal. The ash-pit should be abolished, and a box substituted. One ash-pit is enough for the barrack, and the box should be emptied into it. The privy and urinal should be drained, and the former reconstructed as a water latrine on Macfarlane's principle.

*The following are the Sanitary Improvements required for Dundee Barracks:—*

1. Reduction of the number of men in each room to the extent stated.

2. Ventilation of each room by a shaft formed out of the spare chimney, and in rooms 10 and 11 by separate shafts. Inlets and remodelled grates to be also provided. Staircases to be ventilated by perforated panes in the windows. Ventilation of the non-commissioned officers' rooms, and the canteen tap-room, by Arnott's ventilators. Guard-room to be ventilated through the roof, and to have its grate remodelled to warm the air in the guard-room and cells, as described. Library and school-room to be ventilated by shafts and inlets. All the barrack-room gas-burners to be ventilated.

3. Ablution-room to be supplied with pegs. Two baths with water laid on to be provided.

4. A ventilated roasting oven to be put up in the cook-house.

5. Women's wash-house to have fixed tubs with water laid on, gratings to stand on, a drying and laundry stove, and roof ventilation.

6. Privies to be drained and reconstructed as water latrines with divisions, half-doors, light, and ventilation. Cesspits to be abolished. One ash-pit to be retained for the barrack, to be raised a little above the level of the ground, paved, drained, and covered. Urinals to be supplied with water.

*Dundee Barrack Hospital.*

The hospital of Dundee barracks is situated at the western extremity of the barrack enclosure, against the slope of the hill, part of which has had to be cut into in order to find space for the foundations. As a consequence of this circumstance the ground floor, which is on the level in front, is a basement behind with a deep sunk area.

The building is three stories high. On the lower floor are placed the stores, the hospital wash-house, and the kitchen. On the floor above is the surgery, and the serjeants' room is on the top flat.

There are four wards in this part of the building, and several rooms suitable for wards are cut off from it and entered by a separate staircase. These rooms are used for pensioners, although under the same roof as the hospital. This is an arrangement which ought never to be permitted in hospitals, and the best thing to do in the present case would be to make over the whole building for sick.

The following table shows the present ward space in comparison with what it would be at 1,200 cubic feet per bed :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 10 | 8 | 2 |
| 2 | 10 | 8 | 2 |
| 3 | 10 | 8 | 2 |
| 4 | 2 | 2 | – |
| Total - | 32 | 26 | 6 |

At a little more than 1,100 cubic feet per bed these wards will hold 26 beds; and, to afford this space, we would advise two beds to be at once removed from each of wards 1, 2, and 3.

Each of the larger wards has six windows, and are light and cheerful. They have ventilating beams in the ceilings, but will require shafts to carry off the foul air. One shaft should be carried from the ceiling of each of the larger wards, 1, 2, and 3, to above the roof, and the ventilating beams would then serve as inlets for fresh air, provided a louvred box were placed under each opening to throw the inflowing current towards the roof.

The small ward would be sufficiently ventilated by an Arnott's silk flap valve in the chimney, and a Moore's louvred pane in the window.

The wards are warmed by the old pattern grate, which should be remodelled to warm part of the admitted air in winter.

The passage and stairs should be ventilated by means of perforated glass panes.

Gas has been recently introduced into the wards, but the burners are not ventilated. Each burner should have a funnel, and a tube carried into the chimney.

The position of the hospital wash-house, within the building and under the sick wards, is decidedly objectionable, and it ought to be removed. It is the only place at present where the sick can have a bath.

We should advise a proper bath and ablution room to be provided, for which no doubt space could be obtained.

The kitchen is under a ward. It requires a shaft and perforated panes for ventilation. It has no oven. Perhaps the best manner of providing one would be to put up a proper kitchen range.

There is one water-closet on the first landing, in a projection built out behind. It requires better ventilation by side windows. This projection might be enlarged to find space for the bath and ablution room.

Besides the water-closet, there are two privies in the back yard. The drainage is stated to be received into a cesspit outside the boundary wall. The privies should be reconstructed and drained along with those of the barracks.

Water is obtained from the town supply, and is good and abundant.

*The following are the Sanitary Improvements required for Dundee Barracks Hospital:—*

1. Removing two beds out of each of the three larger wards.

2. Ventilating these three wards by shafts carried from the ceiling to above the roof; by converting the present ventilating beams into inlets as described; and by remodelling the fire-grates. Small ward to be ventilated by an Arnott's silk-flap valve and a Moore's louvred pane. Gas-burners to be ventilated.

3. Hospital wash-house to be removed outside the building.

4. Kitchen to be ventilated by a shaft carried from the ceiling to above the roof, and by perforated panes. A new cooking range to be provided.

5. A bath and ablution room, with hot and cold water laid on, to be provided by enlarging the projections behind the staircase. Ventilation of the water-closet to be more effectually cut off from that of the staircase.

6. Privies in the yard to be drained, and reconstructed on Macfarlane's principle.

## XII. PERTH BARRACKS.

There are two barracks in the city of Perth; one a cavalry barrack, which has been adapted for infantry, and known as Perth barracks; the other is called Victoria Street barracks, and is used for recruits and militia.

### 1. Perth Barracks.

This barrack is situated at the outskirts of the town, within an enclosure six acres in extent. It is isolated from buildings, except a few detached houses, sheds, &c., on the east and south-east sides; and as the position is higher than that of the town generally, there are sufficient means of natural drainage. The subsoil is clay. The buildings are of sandstone, and were erected in 1792–93.

Having been originally intended for cavalry, these barracks have the usual construction of cavalry barracks.

The enclosure is a long parallelogram, with the barracks at one end. They consist of three blocks, forming three sides of a square. The officers' quarters are in the centre block, and the men's rooms in the sides. The riding-school is placed behind, and the hospital is at the end of the enclosure furthest from the barrack-rooms.

The men's blocks are of the usual cavalry construction, having stables below, and rooms over them opening right and left out of a central passage or corridor, reached by two broad flights of stairs in each block.

All the stables have been converted into barrack rooms, except stalls for 48 horses. These rooms enter from the foot of the stairs, and run from front to back of the building. They have sliding windows at each of the opposite ends, but the rooms above have a window on one side only.

The lower rooms have regulation space for 26 men each, at 430 cubic feet per man, and the upper rooms hold 10 men each, with 392 cubic feet per man. There are in all 30 rooms, the details of the accommodation in which are given in the following table :—

| Rooms. | Total present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 1 to 10 inclusive | 100 | 70 | 30 |
| Nos. 11 to 17 inclusive | 182 | 133 | 49 |
| Nos. 21 to 30 inclusive | 100 | 70 | 30 |
| - | 382 | 273 | 109 |

By allowing somewhat less than 600 cubic feet per man in all the rooms, these barracks will accommodate 273 men; and to do so, the regulation number of men per room should be reduced in the first and third series of rooms (those upstairs) from ten to seven men per room; and in each of ground-floor rooms in the second series (the stable rooms) from 26 to 19 men per room. We are of opinion that the numbers we have assigned are the maximum numbers which these rooms ought to contain.

Some provision has been made for ventilation by carrying a hollow beam through and through the ground-floor rooms from front to back, with openings into the room at the ceiling.

These beams might be used as inlets for fresh air in the manner we have advised, with other similar arrangements, namely, the openings into the rooms should be enlarged to a sufficient sectional area, and protected by louvres, to throw the inflowing current up to the ceiling. An outlet shaft will be required besides. It should be carried up in an angle of the room, from the ceiling to above the roof.

The upper rooms are ventilated by openings in the ceiling into the roof. One of these openings should be connected with a louvred shaft carried above the roof. The other openings should be closed, and an inlet of the usual form and dimensions made through the outer wall.

The fire-grates in all the rooms are on the old pattern, and require to be remodelled to save fuel, and to warm part of the air admitted during winter.

The central passage between the upstairs rooms is lighted by a good skylight, and it is ventilated into the roof. The plan is not an efficient one, and we would advise that the ventilation be carried from the openings above the roof by means of one of Mackinnel's or Muir's ventilators. The passage windows should at the same time have perforated glass panes put into the window sashes.

The serjeants' quarters have no ventilation. An Arnott's silk flap ventilator should be put up in each.

There is a library in one of the end rooms; it requires ventilation and warming like the barrack-rooms. There are two fireplaces in the school-room, one of which might be disused if the fire-grate in the other were remodelled to warm part of the air admitted for ventilation. The disused chimney shaft might be easily converted into a foul-air shaft by making an opening into it double its sectional area close to the ceiling. An inlet for fresh air should also be made through the outer wall.

All the barrack-rooms are lighted with candles, although the passages are lighted with gas. We would advise a ventilated gas-burner to be introduced into each room.

There are three stables under the barrack-rooms. These require shafts carried up from the corners to above the roof. The shafts should have an aggregate area equal to 12 square inches per horse.

There are two ablution-rooms recently fitted up. They are in an outbuilding on the ground floor at the end of the entrance passage. The tables require ledges to prevent the water dashing over on the men, and there are no pegs.

There are no baths, but space could easily be found in the projecting buildings behind for two in each wing. They should have water laid on. In each wing of the barracks there is a cook-house on the ground floor of a projecting building. They are supplied with boilers, but up to the present time there are no ovens. This deficiency should be supplied.

A detached women's wash-house is placed on one side of the barrack square. It requires fixed tubs with water laid on, a drying and laundry stove, and a louvre for ventilation through the roof.

An abundant water supply is derived from Perth waterworks.

The surface drainage is imperfect from want of trapping of the drains, and there is no drainage for the privies. There are four of them, two on each side, connected with cesspits, which are also used as ash-pits, the whole contents being removed at intervals by the contractor. The privies are, besides, of very defective construction; they have not sufficient light and ventilation, and the urinals are placed under the same roof.

The whole require reconstruction as water latrines on Macfarlane's principle; they should have divisions of seats, half-doors, and sufficient ventilation and light through the roof, and their contents should be discharged into the town drains. Proper urinals should be constructed outside the latrines, and their contents disposed of in a similar manner.

The riding school of the former cavalry barrack is now used as a drill shed, for which it is very well adapted, except that it requires ventilation, which might be easily given by raising the ridge tiles; and more light should be admitted either by skylights or by opening out the back windows, which are at present blocked up.

There is a canteen, a one-story building, with two good tap-rooms; they are unventilated, and require

an Arnott's silk flap ventilator in the chimney of each room, and perforated glass panes in the windows. The tap-room has a large wasteful fire-grate, which might be remodelled with advantage to warm part of the admitted air.

These barracks have no day-room, and no workshops, except the cavalry forge, which is now used as an armourer's shop. They have no accommodation for married non-commissioned officers or soldiers.

There are no cleaning-rooms, because these rooms, of which there were four, have been diverted from their original use to form a serjeants' mess-room, a school-room, a regimental store, and a pensioners' armoury.

There is no serjeants' mess kitchen. It would be desirable to convert the store into a kitchen for this purpose.

The guard-room is not ventilated, and the only outlet for foul air is by a staircase into a room above it.

A proper shaft should be carried from the ceiling of the guard-room to above the roof. The fire-grate should be remodelled, and an inlet for fresh air of the usual form should be provided close to the ceiling.

*The following is a Summary of the Sanitary Improvements necessary for Perth Barracks:—*

1. Number of men in each ten-men room to be reduced from 10 to 7; and in each twenty-six-men room to 19.

2. Each of the barrack-rooms to be ventilated by a shaft and inlet for air, and by a remodelled grate, in the manner described. Corridors to have their ventilation improved by shafts carried through the roof, and perforated glass panes in the windows. Each barrack-room to have a ventilated gas-burner. Serjeants' quarters to have Arnott's silk flap ventilators in the chimneys. Library to have one of its chimney shafts converted into a ventilating shaft. The fire-grate in the other chimney to be remodelled, and an inlet for fresh air close to the ceiling to be provided. Guard-room to be ventilated by a shaft, inlet, and remodelled grate. Canteen tap-room and non-commissioned officers' room to be ventilated by Arnott's silk flap valves and perforated glass panes.

Stables to be ventilated by shafts from the corners carried above the roof. Riding school to be ventilated by raising the ridge tiles, and to have more light by skylights or windows.

3. Ablution tables to have ledges, and pegs to be put up in the ablution-rooms.

4. Four baths, with water laid on, to be provided.

5. Cook-houses to be supplied with ventilating roasting ovens.

6. Women's wash-house to have fixed tubs with water laid on; a drying and laundry stove, and ventilation through the roof.

7. Privies to be reconstructed on Macfarlane's principle, to be properly lighted and ventilated, and to be drained into the town sewers. Urinals to be reconstructed and drained. Cesspits to be filled up. The bottom of the ash-pit to be raised above the level, and to be paved and drained.

*Perth Barracks Hospital.*

This is a small hospital situated at the lower angle of the parade ground. It has no enclosure in front, and it is overlooked by some houses outside the boundary wall. The building is two stories high. On the ground floor there is a ward, a serjeants' room, and a nurses' room, used as a store; and above these rooms there are two wards and the surgery.

The total regulation accommodation is for 24 beds, at from 424 cubic feet to 629 cubic feet per bed.

The following table gives the details for each ward:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 10 | 6 | 4 |
| 2 | 10 | 6 | 4 |
| 3 | 4 | 2 | 2 |
| Total - | 24 | 14 | 10 |

The dimensions of the wards are such that it is impossible to give 1,200 cubic feet per bed, without leaving a considerable remainder or a considerable deficiency. We have preferred the latter course in the present case, as a temporary expedient, on account of the small size of the hospital in proportion to the barrack. It would be better, if practicable, to remove one bed more from each ward than we have required in the table; but the number of beds should on no account exceed those laid down; and the sooner the accommodation is extended the better will it be for the sick.

Some provision is made for ventilation in the two larger wards, but it is not sufficient. The lower ward has a ventilating beam, which might be used as an inlet for fresh air by enlarging the openings in the beam and protecting them with louvres so disposed as to throw the inflowing current up to the ceiling. It would be necessary at the same time to carry up an outlet shaft from one corner of the ward to above the roof.

The upper large ward should have a shaft carried from its ceiling above the roof, and two inlets for air, one on each side the ward, should be made close to the ceiling.

The smaller ward would be sufficiently ventilated by an Arnott's silk flap ventilator in the chimney, and one inlet for air.

The fire-grates of these wards should be remodelled on the plan recommended for the barrack-room grates.

It would further improve the ventilation of the whole building to carry a shaft from the ceiling of the staircase above the roof, and to introduce perforated glass panes into the upper window sashes. There is no gas in the hospital. A ventilated gas-burner should be introduced into each ward.

There is no ablution-room for the sick, and no bath-room. The baths are kept in the wash-house in the back yard. A small room, with a Macfarlane's ablution table, and a fixed bath, with hot and cold water laid on, is much required. A suitable projection to contain them could easily be constructed.

The hospital wash-house is not provided with the necessary conveniences for washing and drying. These should be supplied.

There is a good detached kitchen in the back yard, but it wants a ventilated roasting oven.

There is a water-closet with two seats, and a urinal, connected with the wards. They are not sufficiently ventilated, and the urinal was offensive. A shaft should be carried from the ceiling of the closets to above the roof, and the urinal should be reconstructed, supplied with water, and kept clean.

There is a privy in the back yard placed over a cesspit, and the ash-pit adjoins it. The cesspit should be abolished, the privy reconstructed on Macfarlane's principle, and drained. The ash-pit should be removed, and an iron box or barrow placed in its stead to receive the hospital refuse, and to remove it every day.

There is no provision store, pack store, nor bedding store, except the nurses' room. The dead-house is dark and unventilated. It requires a skylight and roof ventilation.

The hospital is very small, and not suited for a barrack of the size to which it is attached. It could be extended to afford the required accommodation.

*The following are the Sanitary Improvements necessary in the present Buildings :—*

1. Reduction of the number of beds in each ward to the extent specified above.

2. Ventilation of wards 1 and 2 by shafts, inlets, and remodelled grates, and of ward No. 3 by an Arnott's silk flap ventilator and one inlet. Ventilation of the staircase by a shaft and perforated glass panes in the windows.

4. A ventilated gas-burner to be put into each ward.

5. An ablution and bath room to be erected, and an ablution table, and one bath, with hot and cold water laid on, to be provided.

6. Wash-house to be provided with fixed tubs, water, gratings, and means of drying linen.

7. Kitchen to be furnished with a ventilated roasting oven.

8. Water-closets to be ventilated through the roof. Urinal to be reconstructed and supplied with water. Privies in the back yard to be reconstructed as a water latrine on Macfarlane's principle, and drained ; cesspit to be filled up, and ash-pit to be removed. Hospital refuse to be collected and removed daily.

### 2. Victoria Street Barrack.

This barrack is situated within the city of Perth. It was formerly a manufactory, and was purchased for its present use during the Crimean war. The buildings consist of one range of two stories and an attic, and other cottage buildings, partly used for quarters, and partly used for a hospital. They enclose among them a small parade ground. The buildings have been occupied by militia. Several of them are much dilapidated, and quite unfit for occupation as barracks, and the worst of these buildings is the hospital.

There is regulation accommodation for 212 men, at about 400 cubic feet per man, the details of which are as follow :—

| Rooms. | Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 20 | 13 | 7 |
| 2 | 30 | 20 | 10 |
| 3 | 70 | 56 | 14 |
| 4 | 60 | 44 | 16 |
| 5, Attic | 25 | 18 | 7 |
| 6 | 7 | 5 | 2 |
| Total - | 212 | 156 | 56 |

The available accommodation in these barracks, at 600 cubic feet per man, is sufficient for no more than 156 men, but the smaller rooms, and the attic in the old mill, are not fit for permanent occupation.

The latter enters by a wooden stair directly from the floor below, which is in fact ventilated into the attic.

We would strongly advise that, in its present state, only rooms 3 and 4 in this barrack should be occupied, and that no more than 100 men be placed in these rooms. All the other rooms are deficient in window space, and the attic is objectionable for the reason stated.

The rooms require ventilation by shafts, inlets, and remodelled grates. The shafts and inlets in the larger rooms should be distributed so as to renew the atmosphere readily in all parts of them.

The rooms are lighted by candles, and the exterior of the barracks is not lighted. Ventilated gas-burners ought to be introduced into the barrack-rooms.

There are no proper means of personal cleanliness ; no ablution-room, no bath, and no means of washing clothes.

There are serjeants' quarters, which are about the best part of the barracks, but they require ventilation by Arnott's ventilators.

There is a tolerable kitchen, but it requires an oven.

A stream of water passes under the barrack square, over which the privies have been erected. They are a great nuisance, especially in summer, from their position and structure. They should be removed from their present site entirely, and reconstructed as water latrines on Macfarlane's principle, with divisions, half-doors, light, and ventilation.

*The following are the Sanitary Improvements required for Victoria Street Barracks :—*

1. Rooms 1, 2, and 5 to be struck off the construction, as being unfit for occupation in their present state ; and the construction in rooms 3 and 4 to be fixed at 100 men, in the proportions given above.

2. These latter rooms to be ventilated by shafts, inlets, and remodelled grates, and to be lighted with gas. Serjeants' quarters to have Arnott's ventilators.

3. An ablution and bath room, with benches, basins, water laid on, one bath, gratings, and pegs, to be provided.

4. A ventilated roasting oven to be put up in the kitchen.

5. Privies to be removed from their present position, and reconstructed as water latrines.

#### *The Hospital.*

The hospital provided for this barrack, which has regulation accommodation for 212 men, consists of a few miserable small low-roofed cottage rooms, hardly fit for occupation by people in health, and quite unfit to treat disease in. It would be a mere waste of money to try to improve the place, and we have no recommendations to make on the subject.

This barrack admits of extension. The mill itself could be improved by the measures we have proposed. The other buildings, including the hospital, should be cleared away and rebuilt, so as to afford the required accommodation.

## XIII. FORT GEORGE.

### Artillery and Infantry Barracks.

Fort George occupies the extreme point of a long spit of land thrown up between the opening of Beauly Frith and Moray Frith. The works extend from sea to sea across the point, and the sea bounds them on three sides. On the fourth side there is an open heath of shingle extending to the east, and there are no houses within a mile and a half of the enclosure.

Naturally the situation is a very healthy one, freely exposed to the sea breezes, and there are no sources of malaria in the country itself which could in any way affect the healthiness of the fort.

Nevertheless, the troops stationed in Fort George have not experienced that immunity from disease which the very favourable position of the barracks would lead us to expect.

Small-pox has lingered among the Militia regiments from time to time stationed there, especially among men and their families who have come from the adjacent highland districts. A fact which clearly proves that there must be some cause of unhealthiness in the buildings, unconnected with the place they occupy. It is true that the site is a low one.

The average level of the ground above spring tides is only about ten feet, but this circumstance taken by itself would not account for local unhealthiness, except in so far as it increased the difficulties of drainage.

The barracks are all substantially built of stone, with slated roofs, and they were erected in 1757. The works are complete and well executed, and taken as a whole Fort George is one of the best military establishments in the United Kingdom, but within it there are certain obvious sanitary defects, which must be removed before troops stationed at it can enjoy that immunity from disease which its favourable local position would lead us to expect.

The barrack accommodation consists of two parts;—barracks proper, and casemates. The latter are constructed behind the curtains on two opposite sides of the esplanade in front of the barracks, and the barracks themselves consist of two divisions, right and left, with a broad central way running from front to rear between them. In each right and left division there is a range facing the esplanade, and at a short distance behind each front range are three blocks of building forming three sides of a square with the angles closed; the open side of the square facing the open side of the square opposite, so as to enclose a large parade ground in the centre of the barracks. Behind these half squares are the hospital, canteen, stores, &c. The privies, urinals, and ash-pits are placed against the curtains.

The two front ranges facing the esplanade are occupied by invalid artillery, stores, infant-school, &c. The two ranges of the squares behind, running parallel to these front ranges, are occupied as men's quarters; and the officers' quarters are in the centre part of each square, the men's quarters forming the wings.

In the front ranges an arcade is carried along the ground floor, over which the rooms above are supported. These rooms are back to back, and are entered right and left from the stairs, four rooms on each flat. They have windows on one side only.

The soldiers' rooms in the squares behind are of a different construction, and consist of a central corridor running from end to end of the range, with the rooms opening out of it right and left. The corridors have a window to the open air at one end, and at the opposite end they are imperfectly lighted by a well, formed by removing part of the flooring at the end of each corridor and placing a lantern in the roof at the top. The light derived in this way is only reflected light, but there is some provision for ventilation by panes in the lantern which can be opened by cords.

The buildings are three stories high. The plan of construction adopted in the squares is not such as to facilitate a free external movement of the air, and moreover, the curtains of the fort being somewhat higher than the barracks, there is a stagnation of air among the buildings except during winds. This defect becomes of more importance when the structure of the barracks is taken into account; and of still greater importance is it when, along with defective structure, there exists overcrowding of the barrack-rooms themselves, and no sufficient means of ventilation. In barracks of this construction, it is indispensably necessary to give sufficient cubic space and abundant means of ventilation, for by these measures alone can original defects, such as we have described, be to any extent neutralized.

The ranges contain 207 men's rooms, and four rooms for serjeants, and the total present regulation accommodation is for 1,408 non-commissioned officers and men, with an average space of about 480 cubic feet per man.

The following table shows the details of the present accommodation, in contrast with what it would be at 600 cubic feet per man:—

| Barrack-rooms. | Total present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. | Number of Men to be allotted to each Room. |
|---|---|---|---|---|
| **Infantry.** | | | | |
| **No. 1.** | | | | |
| Ground Floor, 12 rooms | 72 | 60 | 12 | 5 |
| 1st Floor { 13 „ | 65 | 52 | 13 | 4 |
| 1 „ | 14 | 11 | 3 | 11 |
| 2nd Floor { 14 „ | 98 | 84 | 14 | 6 |
| 1 „ | 18 | 11 | 7 | 11 |
| **No. 2.** | | | | |
| Ground Floor, 2 „ | 12 | 10 | 2 | 5 |
| Centre „ 4 „ | 20 | 16 | 4 | 4 |
| Upper „ 4 „ | 28 | 24 | 4 | 6 |
| **No. 3.** | | | | |
| Ground Floor, 2 „ | 12 | 10 | 2 | 5 |
| Centre „ 4 „ | 20 | 16 | 4 | 4 |
| Upper „ 4 „ | 28 | 24 | 4 | 6 |
| **No. 4.** | | | | |
| Ground Floor, 12 „ | 72 | 60 | 12 | 5 |
| „ „ 1 „ | 17 | 13 | 4 | 13 |
| Centre „ 13 „ | 65 | 52 | 13 | 4 |
| „ „ 1 „ | 14 | 11 | 3 | 11 |
| Upper „ 14 „ | 98 | 84 | 14 | 6 |
| **No. 5.** | | | | |
| Ground Floor, 12 „ | 72 | 60 | 12 | 5 |
| Centre „ 13 „ | 65 | 52 | 13 | 4 |
| „ „ 1 „ | 14 | 11 | 3 | 11 |
| Upper „ 14 „ | 98 | 84 | 14 | 6 |
| „ „ 1 „ | 18 | 11 | 7 | 11 |
| **No. 6.** | | | | |
| Centre Floor 4 „ | 20 | 16 | 4 | 4 |
| Upper „ 4 „ | 28 | 24 | 4 | 6 |
| **No. 7.** | | | | |
| Upper Floor 4 „ | 28 | 24 | 4 | 6 |
| **No. 8.** | | | | |
| Ground Floor, 12 „ | 72 | 60 | 12 | 5 |
| „ „ 1 „ | 17 | 13 | 4 | 13 |
| Centre „ 12 „ | 60 | 48 | 12 | 4 |
| „ „ 1 „ | 14 | 11 | 3 | 11 |
| Upper „ 14 „ | 98 | 84 | 14 | 6 |
| „ „ 1 „ | 18 | 11 | 7 | 11 |
| **Artillery.** | | | | |
| Ground Floor, 2 „ | 30 | 22 | 8 | 11 |
| Centre „ 2 „ | 26 | 22 | 4 | 11 |
| „ „ 1 „ | 10 | 8 | 2 | 8 |
| „ „ 1 „ | 8 | 6 | 2 | 6 |
| Upper „ 3 „ | 33 | 27 | 6 | 9 |
| „ „ 2 „ | 18 | 14 | 4 | 7 |
| Total 207 | 1,400 | 1,146 | 254 | — |

As the barrack-rooms will not divide equally into spaces of 600 cubic feet each, we have preferred to give rather less than 600 feet per man, and at this amount the whole barracks will accommodate 1,146 men, instead of 1,400, and hence 254 men should be removed from the construction.

The last column in the table shows the number of men to be allotted to each room in the different flats of the barracks.

Generally speaking the rooms are not good. Many of them are small, low in the roof, and deficient in light. No fewer than 188 rooms have only one window each. There are only 11 barrack-rooms with three windows each, and the remaining eight rooms have two windows each.

Many of these windows do not open above and below. They should all be made to do so. Every facility for ventilation should be given in such buildings.

The only means of renewing the air at present is by small panes of wire gauze or perforated zinc in the windows, but these are not enough, and each room will require a shaft to be carried up from one

corner of the ceiling to above the roof, to act as an outlet, and one inlet should be made close to the ceiling as near as may be over the window. The outlet shaft should be carried up in one of the corners opposite the window.

The rooms on the top floor should have a louvre, instead of a shaft, carried above the ridge.

The larger rooms, which have regulation accommodation for from 14 to 18 men, will require two inlets. These rooms are dark, and should have increased window space, if possible. Those on the top floors should have skylights.

All the rooms are warmed by the old pattern grate, which should be removed, and a new grate put up to warm part of the air admitted during winter. Each non-commissioned officer's room should have a silk flap ventilator put into the chimney.

In one of the blocks two rooms are used as officers' kitchens. They require ventilation by a shaft and inlet. The serjeant's mess has two fireplaces, the chimney of one of which might be used as a ventilating shaft by making an opening into it close to the ceiling double the sectional area of the chimney.

The ventilation of the corridors and passages is very defective, but it might be improved by two or three large louvres being carried up from the centre line of the ceiling through the ridge in the upper floors of all the long passages, and by filling the upper sash of each end passage window with panes of perforated glass.

These louvres would ensure a certain amount of change in the air of all the corridors through the staircases and wells, which might be increased by a few grated openings placed in the floors of the two upper corridors passing through the ceilings below.

The ventilation at present existing, by means of the lantern and well at the end of the passages, should be rendered permanent, and placed beyond the control of the men, by having fixed louvres placed in the lantern.

All the rooms are lighted by candles, and gas is not obtainable unless it were made on the spot.

There are no day-rooms for the men, but the amount of accommodation within the fort is so considerable in proportion to its ordinary occupants that possibly some men's rooms might be advantageously set apart for day-rooms when they can be spared.

The garrison chapel, which is situated in the rear of the barracks, has been fitted up as a chapel school. It is warmed by stoves, but is not sufficiently ventilated. One of Mackinnel's or Muir's ventilators placed in the centre of the roof would remedy this defect.

On the ground floor of the artillery range there is a dark room used as an infants' school. It would be advisable, if possible, to find a room better adapted for such a purpose. The present room should be ventilated like the barrack-rooms.

The library situated in the same range, but above the arcade, requires an Arnott's ventilator into the chimney. This room is also rather dark for the object to which it is devoted.

There are five cleaning-rooms in ranges 1, 4, 5, and 8, and two rooms in Nos. 2, 3, 6, and 7. The accommodation appears to be sufficient.

On the ground floor of Nos. 1 and 5 barracks under the men's rooms, and communicating with them by the passages and staircases already mentioned, are two men's ablution-rooms, with accommodation for about 30 men in each. They have the necessary fittings, but it is to be regretted that in so humid a locality, and in so ill-ventilated a building, ablution-rooms, with so large a surface constantly wet, and exhaling moisture into the air of the barrack ranges, should have been placed. They should have been constructed behind the ranges, and connected with the corridors by a covered passage. They require ventilation by fitting the upper window sashes with panes of perforated glass, and by converting the disused chimneys into ventilating shafts, by making openings into them close to the ceilings.

There are no baths, and the absence of this means of cleanliness is hardly compensated for by the proximity of the sea, which, although it be a great advantage for health, cannot be used as a substitute for washing the body with soft water. Eleven baths, with water laid on, would be required for the reduced strength we have given in the table, but not one of them ought to be placed in the ablution-rooms. These rooms have table space for about 5 per cent. of the strength instead of 10 per cent., and consequently the ablution accommodation is only one-half in amount which it ought to be, and there is no space to spare for baths, even if the position were unobjectionable.

There is no laundry, properly speaking, but there are three women's wash-houses. Two of them are in No. 6 range on the ground floor, and from their situation they are open to the objections stated against the ablution-rooms. The third wash-house is in a detached building in the rear. It has been proposed to remove the wash-houses in No. 6 range, a proceeding of which we entirely approve, and to extend the detached wash-house to make it sufficient for the wants of the whole barrack. This should be done at once, and the detached wash-house should be supplied with fixed tubs, and water laid on, gratings, a drying and laundry stove, and roof ventilation.

There are eight cook-houses, two on the ground floor of each of the ranges 1, 4, 5, and 8. Each has four boilers, and all the heat and steam from the cooking passes into the corridors, staircases, and rooms of the four blocks.

It has been proposed to remove the whole of these kitchens into detached buildings, and this should be done with as little delay as possible. It would be desirable to fit up one of the new cook-houses with a Benham's cooking range, similar to the one at Woolwich, to cook for 650 men, and the other cook-house might be fitted up with improved boilers in pairs, and roasting ovens to cook for 500 men.

Until the cook-houses are removed we would recommend that the freest practicable ventilation be given to them by several glass louvres in the windows, and by shafts carried from the ceiling to above the roof. We cannot advise ovens to be introduced in such a situation, especially as there are large brick bakers' ovens at the canteen, to which the men could have access.

The condition of the drainage and water supply of Fort George has given rise to some discussion on account of alleged infiltration of wells by impure surface drainage and percolation from cesspits and drains, and a plan has been proposed by the commanding engineer to remedy this evil.

There can be no doubt in the first place that the drainage requires improvement, and there can be as little doubt that from some cause or other one or two of the wells have become polluted with organic matter, and supply water unfit for use.

To understand the bearings of the question it must be borne in mind that the whole ground on which Fort George stands, as well as the ground to some distance from it, is porous shingle, and that the mean height of the ground is about ten feet above high-water mark at spring tides. There are but two sources from which the shingle can become charged with water, namely, the sea and the rain-fall. The ingress of sea water is no doubt to a certain extent checked by the foundations of the fort and buildings, but the general quality of the water supplied by wells within the fort will depend materially on the relative level maintained in the subsoil by the sea water and the rain water. Again, the fort is drained after a manner into the sea, and the drains being of old construction and of masonry, and no doubt perfectly pervious to water, allow the sea water at high tides to escape through their sides into the subsoil within the fort, and thus become a means of increasing the impurity of the well water. These drains are intended to convey away foul liquids of

all kinds into the sea, but their walls being pervious they allow the fluids to percolate into the subsoil, to the detriment of the wells. The proof of this is the fact that there is a penstock at the lower end of the main drain, to enable it to be flushed at low water, but it is found that instead of there being a rush through the drain at such times, the whole fluid has escaped from the drains into the subsoil as stated.

It is clear, then, that the system of drainage which has been adopted has had an effect the reverse of what was intended.

But this is not the worst feature of the case. There are a number of cesspits connected with officers', men's, and hospital privies, &c., having overflows, which are connected with two immense cesspits, 15 feet square by 12 feet deep, one on either side of and within the fort. These large cesspits have an overflow connected with the main drains, but it is found that the contents of these cesspits stand considerably below the surface level, instead of overflowing, while the bottoms of the wells supplying drinking water are from 5 to 8 feet below the bottom of the cesspits.

One might almost say that the whole drainage arrangements of this fort had been elaborately planned to ensure that the subsoil out of which the water supply is derived should be, as far as possible, saturated with organic matter and sea water.

Obviously, the very first thing to be done is to drain the fort properly by water-tight pipe drains, carefully laid in concrete, and ventilated above high-water level, and to convey away by these drains the entire fluid refuse of the fort, to cleanse and fill up all cesspits and existing drains, and to cleanse the existing wells.

An additional and purer water supply might be obtained from a spring at no great distance outside the fort, and laid on by pressure ; or, if it be considered absolutely necessary to have the supply within the fort, additional wells might be sunk in the esplanade, at the greatest possible distance from the sea, and from the polluted subsoil in which several of the existing wells are sunk.

As soon as the drainage is provided, the officers' privies, those at the hospital, and others belonging to different ranges, should be converted into water-closets, connected with the main pipe drain by branch pipe drains laid in concrete, and properly ventilated.

The men's privies should be converted into water latrines, on Macfarlane's principle, and flushed out daily ; and the urinals should also be carefully drained.

The works for improving the drainage and water supply are both urgent, and ought to be proceeded with at once.

The existing ash-pits and any manure pits should be filled up, raised a little above the ground, paved, covered, and drained, or the barrack refuse should be removed daily ouside the walls of the fort.

By the execution of these works, every precaution against the pollution of the subsoil will have been taken which the case admits of.

The men's privies, when reconstructed, should have divisions of seats, half-doors, light, and ventilation.

There are no drill sheds in these barracks, but there are the two arcades already mentioned as extending along the front of the artillery ranges, which might perhaps be used for such a purpose.

The accommodation for trades is deficient, and soldiers' rooms are temporarily appropriated for this purpose. It is proposed to extend the accommodation for trades by appropriating, for this purpose, the rooms now used as women's wash-houses.

There is no accommodation for married soldiers except misappropriated barrack-rooms.

There is a good canteen, but the tap-room is rather dark. It is ventilated into another building or out-house. The non-commissioned officers' room requires a similar ventilator.

The casemates already mentioned are not fit for occupation by men. They have no flooring except the earth, which is below the level of the ground outside ; they have no ventilation, and they are dark. They have been recently used by militia in preference to camping out, but they are not fit even for such a temporary purpose.

To render them habitable they would require the floors to be raised above the outside level, and to be properly boarded, ventilating shafts with inlets and remodelled grates to be provided, and the windows to be enlarged to afford sufficient light to the interior.

The guard-room is arched and placed under the rampart. It requires perforated glass panes and a remodelled grate to improve its means of ventilation and warming, and the adjoining urinal should be reconstructed.

*The following are the Sanitary Improvements required for Fort George :—*

1. Reducing the number of men in each room to the extent shown in the table.

2. The smaller barrack-rooms on the two first floors of the ranges to be ventilated by a shaft, inlets, and remodelled grate each. Larger rooms to have a shaft, two inlets, and a remodelled grate. Rooms on the top floors to be ventilated by a louvre through the roof, an inlet, and remodelled grate. Passages and corridors to be ventilated by three louvres carried up from the ceiling of the upper corridor to above the roof. The lantern over the well at the end of each corridor to have fixed louvres for ventilation. Each passage and stair window to have perforated glass panes in the upper sash. All the barrack-room windows to be made to open above and below.

Large barrack-rooms on the upper floors to have more light by skylights.

Officers' kitchens to be ventilated by a shaft and inlets.

Serjeants' mess to be ventilated by an opening into the disused chimney. Non commissioned officers' rooms and library to have an Arnott's silk flap ventilator into the chimney..

Chapel school to be ventilated through the roof, as described.

Infant school to have a shaft and inlet.

Ablution-rooms to be ventilated by perforated panes, and by converting the disused chimney shafts into ventilating shafts, as described.

3. Women's wash-houses to be removed out of the barrack ranges. The detached wash-house to be reconstructed or extended to afford all the required accommodation, and to have fixed tubs with water laid on, gratings, boilers, and a drying and laundry stove.

4. A bath-house, with eleven baths, and water laid on, to be provided.

5. Present men's cook-houses to be ventilated by louvres in the windows and shafts, and the whole to be removed out of the ranges, and detached cook-houses provided as soon as practicable.

6. The whole drainage to be reconstructed. Impervious drains to be laid down to the sea. All existing drains and cesspits to be filled up and abolished. Officers' water-closets to be provided. Men's latrines to be reconstructed on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation.

7. Wells to be cleansed. Water to be laid on from the spring, or additional wells to be sunk.

8. Ash-pit to be filled up, paved, and drained, as described, or the whole refuse to be removed once a day out of the fort.

9. Non-commissioned officers' room at the canteen to be ventilated.

10. Guard-room to have a remodelled grate, and perforated glass panes for ventilation.

Lastly, the casemates to be improved as suggested, if they are to be used at all for men's quarters.

*Fort George Hospital.*

This hospital consists of a large two-story building, with an attic, placed behind the men's ranges, from which it is separated by a roadway. The position is not very airy, and there is no enclosure for convalescents except a narrow back yard, in which are situated the kitchens, privies, &c. The hospital is divided into two parts, one regimental, the other for the garrison. There are two staircases, and there is also a direct communication from ward to ward of each hospital.

On the ground floor are two surgeries, serjeants' room, and one ward. The flat above is occupied by wards in both hospitals. The attic is lofty and airy, and if properly lined, plastered, supplied with sufficient window space, and ventilated, it might be used for extending the hospital accommodation. There are six wards in all, three in each hospital, with regulation space for 72 beds, with from 700 to 750 cubic feet per bed. The following table gives the details of the ward accommodation and its deficiencies :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| Regimental. | | | |
| 1 | 14 | 9 | 5 |
| 2 | 8 | 6 | 2 |
| 3 | 14 | 9 | 5 |
| General. | | | |
| 1 | 14 | 9 | 5 |
| 2 | 8 | 6 | 2 |
| 3 | 14 | 9 | 5 |
| Total | 72 | 48 | 24 |

At an average a little below 1,200 cubic feet per bed, these six wards will hold 48 beds, but as already stated, the attics might be made to afford additional space if improved in the manner pointed out. The wards would not be very good, but they would afford accommodation for the less severe cases.

There is no space for orderlies, who have in consequence to sleep in the wards among the sick. This practice we have often condemned, and in all hospitals some provision should be made for affording separate sleeping accommodation for these attendants.

The general structure of the wards is not favourable to ventilation.

The two smaller wards have two windows only on one side. The four larger wards have two windows at each of the opposite ends, but the distance between these windows is 35 or 36 feet, and the beds are ranged along the dead walls. A few squares of perforated zinc have been placed in these windows, but they are by no means sufficient for effectually renewing the air.

It will be necessary, therefore, to carry up a shaft from the ceiling of each ward to above the roof, to act as an outlet for foul air, and to introduce two inlets, one at each end of the four larger wards, close to the ceiling. The two small wards should have one inlet each. All the ward fire-grates should also be remodelled to warm part of the admitted air. The serjeant's room requires a silk flap ventilator into the chimney.

Each of the staircases should be ventilated by perforated glass panes in the windows.

In the small narrow yard behind the hospital are two kitchens, one for each hospital, an ablution-room, and two privies. These offices are not in good condition, and require improvement.

The kitchens have ovens and boilers, but they have very old grates. A new cooking range would be a great advantage.

The ablution-room has no proper ablution accommodation, and there are no fixed baths.

There is space enough to put up a proper hospital ablution table, with sunk basins and hot and cold water laid on, and also one or two baths similarly supplied with water. Part of the ablution-room would have to be cut off for a bath-room, and the whole would have to be properly lighted and ventilated through the roof. Hot water might easily be supplied by pipes from the kitchen.

The ablution and bath room would have to be connected with the hospital by a covered passage.

The water latrines in the back yard are dark and unventilated. They require light and ventilation through the roof.

There are no water-closets for sick. Space for two could easily be found by building a projection behind the staircase, with a door on the landing.

There is no dead-house, hospital wash-house, nor proper stores except a small room inside the serjeant's quarters. A small wash-house for bandages, dressings, towels, &c., would be an advantage, and a dead-house should be provided.

One of the wells from which the hospital water is derived is in so polluted a condition, apparently from impurities in the subsoil, that we should recommend the pump handle to be removed and the water not to be made use of for any purpose.

The question of improving the water supply of the hospital should be considered along with that of the barrack, and both should be improved at the same time.

*The following are the Sanitary Improvements required for Fort George Hospital:—*

1. Reduction of the number of beds per ward to the extent shown in the table.

2. Ventilation of each ward by a shaft, inlets, and remodelled grate. Ventilation of the staircases by perforated glass panes. Serjeant's room to be ventilated by a silk flap ventilator.

3. Ablution-room to be lighted and ventilated through the roof, and provided with an ablution table having hot and cold water laid on. A separate bath room, with two baths and hot and cold water laid on, to be provided. The ablution and bath room to be connected with the hospital by a covered passage.

4. Two water-closets placed in a projection behind and opening from the staircases, to be provided. Water latrines in the yard to have light and ventilation through the roof.

5. A dead-house and hospital wash-house to be provided.

6. The well from which impure water is derived to be closed, and a better water supply to be provided for the hospital.

JOHN SUTHERLAND.
DOUGLAS GALTON.
W. H. BURRELL.

To the Secretary of State for War.

Barrack and Hospital
Improvement Commission,
November 2, 1859.

# CITY OF DUBLIN DISTRICT.

SIR,

HAVING completed our inquiries and examinations into the sanitary condition of the barracks and military hospitals within the city of Dublin district, we have the honour to report on them as follows:—

The barracks and hospitals we have inspected are:—

1. The Royal Barracks, cavalry and infantry.
2. Arbour Hill, cavalry and infantry.
3. Island Bridge, cavalry.
4. Ship Street, infantry.
5. Portobello, cavalry and artillery.
6. Richmond, infantry.
7. Beggar's Bush, infantry.
8. Pigeon-house Fort, artillery.
9. Aldborough House, recruits.
10. Linen Hall, infantry.
11. General Military Hospital, Phœnix Park.
12. Arbour Hill, regimental hospitals.

## I.—THE ROYAL BARRACKS.

This large establishment is situated at the western extremity of the city of Dublin, on ground sloping from Arbour Hill towards the river Liffey. The barrack is on the north side of the river, at a distance of about 350 feet, and about 20 feet above its level. The general direction of the buildings is parallel with the river, between which and the boundary wall there are two public roads and a long esplanade.

The ground forms a parallelogram, about 1,000 feet in length, and its area is 13A. 3R. 10P., exclusive of the ground occupied by the adjacent Arbour Hill barrack and hospitals, and the military prison, &c. The subsoil is yellow clay, resting at a depth of 20 feet on calcareous rock. The buildings are almost entirely of stone; part of them date from the year 1704, other portions have been added at different intervals, and the cavalry barrack was built in 1793.

The main buildings are arranged in three squares, called the "Royal Square," the "Palatine Square," and the "Cavalry and Stable Square."

The Royal Square is in the centre of the front, and is formed on three continuous sides by officers' and soldiers' quarters, three floors in height. On the fourth side it is open to the river.

Immediately to the east is the Palatine Square, which is a closed square of buildings, four stories in height. To the west of the Royal Square is the Cavalry and Stable Square, consisting of four detached blocks of soldiers' quarters and stables, arranged in a square with two blocks of officers' quarters in front, and two detached ranges of quarters and stables behind. Behind these several squares are situated the riding school, canteen, magazine, cookhouses, workshops, ablution houses, privies, &c.

Much of the ground is covered with lofty buildings, arranged in such a manner as to interfere with free ventilation and light, and there are long ranges of officers' and soldiers' quarters three and four stories high, at a distance of about 22 feet from each other, leaving a gloomy passage between them, from which the only direct light and ventilation of the rooms is obtained. This is a fault in the plan which does not admit of remedy.

The Royal Square and Palatine Square have arcades of stone running round them inside the square; out of these arcades the soldiers' rooms on the ground floor are entered. Over the arcades are long passages 6 feet and 6 feet 3 inches wide, facing into the court, with glazed windows at intervals. These passages afford access to the soldiers' rooms, and are themselves reached by staircases in the angles or sides of the ranges. On account of this mode of construction, direct light and air are supplied to one side only of the rooms, and as many of these rooms look into the narrow passage between the adjacent squares to which we have referred, they are gloomy and badly ventilated. Indeed the introduction of a closed passage covering the rooms on one side is in itself open to the objection that it interferes injuriously with light and ventilation, and ought not to be copied in either barracks or hospitals in future.

In the Cavalry and Stable Square, and adjacent ranges, the soldiers' rooms are partly in a three-story block, and partly over stables. Two ranges of stables have stores over them.

The following table shows the allotment of the men's accommodation in the different portions of each barrack, and also the excess of occupants in each series of rooms, over what the numbers would be at 600 cubic feet per man:—

| Rooms. | Total present Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Royal Square: | | | |
| Ground Floor - 19 | 152 | 114 | 38 |
| „ - 1 | 4 | 3 | 1 |
| Second Floor - 27 | 216 | 162 | 54 |
| „ - 1 | 10 | 7 | 3 |
| Third Floor - 1 | 22 | 14 | 8 |
| „ - 30 | 240 | 150 | 90 |
| „ - 1 | 10 | 6 | 4 |
| Attics over Stables 1 | 41 | 41 | — |
| „ - 1 | 33 | 30 | 3 |
| „ - 1 | 60 | 60 | — |
| Palatine Square: | | | |
| Ground Floor - 17 | 136 | 85 | 51 |
| „ - 1 | 6 | 3 | 3 |
| Second Floor - 5 | 85 | 50 | 35 |
| „ - 9 | 72 | 45 | 27 |
| „ - 1 | 10 | 6 | 4 |
| „ - 1 | 12 | 11 | 1 |
| Third Floor - 13 | 104 | 52 | 52 |
| „ - 6 | 102 | 54 | 48 |
| „ - 1 | 10 | 6 | 4 |
| Fourth Floor - 12 | 96 | 60 | 36 |
| „ - 1 | 10 | 6 | 4 |
| „ - 6 | 104 | 48 | 56 |
| „ - 1 | 10 | 5 | 5 |
| „ - 1 | 12 | 6 | 6 |
| Cavalry Square: | | | |
| C. - - 2 | 20 | 12 | 8 |
| „ - - 2 | 12 | 8 | 4 |
| „ - - 3 | 30 | 18 | 12 |
| „ - - 2 | 12 | 8 | 4 |
| „ - - 3 | 30 | 18 | 12 |
| D. - - 1 | 10 | 7 | 3 |
| „ - - 1 | 16 | 11 | 5 |
| „ - - 2 | 20 | 12 | 8 |
| „ - - 1 | 6 | 4 | 2 |
| „ - - 1 | 10 | 10 | — |
| „ - - 2 | 20 | 12 | 8 |
| „ - - 1 | 6 | 4 | 2 |
| Attics over Stables: | | | |
| No. 1 | 40 | 28 | 12 |
| „ 2 | 50 | 34 | 16 |
| „ 6–7 | 78 | 78 | — |
| Total - - | 1,917 | 1,288 | 629 |

The deficiency of accommodation amounts to about 30 per cent. There are a few rooms in which each man has more than 600 cubic feet, but there are a number of rooms in which the space is under 280 cubic feet, while the space in the great majority of rooms gives from 300 to less than 400 cubic feet per man.

In the table we have indicated as nearly as possible the number which ought to be removed from each series of rooms to give 600 cubic feet per man, but

as the space will not divide equally, we have in the great majority of instances given rather less than that amount.

The following abstract shows the total reduction of numbers required for each barrack :—

| —— | Total present Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Royal Square - - | 788 | 587 | 201 |
| Palatine Square - | 769 | 437 | 332 |
| Cavalry and Stable Square and Attics. | 360 | 124<br>140 | 68<br>28 |
| Total - - | 1,917 | 1,288 | 629 |

The over crowding in many of the rooms is so great that before the beds are folded down the tables have to be removed, and when down the beds cover the floors so closely that only a narrow passage hardly broad enough for a man to pass between the beds is left.

The rooms in different barracks vary considerably in character. A few are tolerably good, though by no means equal to the rooms in Irish country barracks, but the majority are bad barrack-rooms. They are small, confined, dark, and uncomfortable, besides being overcrowded. Indeed, the general plan of the buildings, especially of the Royal and Palatine Squares, is not well adapted for barrack purposes, so far as the health and comfort of the men are concerned, in which respect their internal arrangements afford a striking contrast to their external appearance. In these two squares there are 131 barrack-rooms with no more than two windows in each room, and in some rooms there is only one window. The same arrangement exists in the smaller rooms of the Cavalry Square.

It is stated by one of the medical officers that he has reason to believe that the stone floors in some barrack-rooms have been instrumental in causing sore throat, and that the sanitary defects generally may have aided in engendering or furthering the development of some severe forms of inflammation of the lungs and consumption.

In all the rooms the window space is much too small in proportion to the number of inmates, and one of the greatest improvements that could be carried out in the rooms in the Royal and Palatine Squares would be to open additional windows, and to enlarge window spaces wherever it is practicable to do so. This we should certainly recommend to be done in the dark corner rooms, which, without additional light, are hardly fit for habitation.

The ventilation throughout the whole of the buildings in these squares is very defective.

To remedy this, we would propose to ventilate all the corridors, passages, and staircases by perforated glass panes in the upper row of all the windows, and by carrying a louvre through the roof from the ceiling of each staircase. We would propose further to ventilate all the barrack-rooms by a foul-air shaft carried from the ceiling of each room to above the roof, and by one inlet to the open air, provided with a diffusing cornice within the room. By these means a circulation of air might be secured through all parts of these great buildings.

While provision is made for ventilation, it would be most advisable to remodel the fire-grates, for the purpose of warming part of the air admitted during winter.

This plan of ventilation and warming is applicable to all the barrack-rooms in the different squares, excepting the long attic rooms. There are six of these rooms over the troop stables. They are from 78 to 188 feet in length, and from 22 to 26 feet broad. They have no ceilings, the room space being open to the roof. Those attic rooms belonging to the Royal Square barracks are of a good height, and have a considerable extent of window space. The windows in the attics belonging to the cavalry ranges are low and distant, and the rooms are dark and gloomy in consequence. One of these rooms is 110 feet long and only 8 feet high ; another, which is 188 feet long, is no more than 11 feet 6 inches high. The raised attics belonging to the Royal Square are from above 12 to nearly 15 feet in height.

The windows in all the attics are placed on opposite sides of the rooms. The number of fireplaces varies from two to six, according to the length of the room. The chimnies are carried up in blocks of two flues each, at intervals in the length of the room, and the fires are back to back.

One defect common to all these attic rooms is want of ventilation ; but the deficiency can be readily supplied by louvres in the ridge. There should be one such louvre between the gable wall of the room and the first fire-place from the end, and one between every block of flues all the way along. For each louvre there should be two inlets with perforated zinc cornices on opposite sides of the room. Part of the admitted air should also be warmed by remodelling the grates.

The attics occupied by cavalry are all too low and too dark. The latter of these defects could be removed by skylights in the roof, but this would leave the chief defect untouched. The side walls should be raised, and the windows made sufficiently large and lofty to light the rooms, as has been done with the other attics. Were this done and the rooms ventilated and warmed, as suggested, they would make good barrack-rooms ; provided also, that the stables below them were thoroughly ventilated. To effect this improvement it would be necessary to carry a shaft from the corner of every stable to above the roof of the range, and to put panes of perforated glass into the stable windows. The shafts should be lined with sheet zinc carefully soldered. If this were done, the effluvia from the stables would be, as far as practicable, prevented from entering the barrack-rooms.

There is very little misappropriation of rooms in the Royal barracks, and at the time the return was sent to us, all the barrack-rooms, except three, were occupied according to regulation.

The barrack generally is lighted with gas, but all the burners require to have ventilating funnels and tubes to convey the products of combustion either into the chimney flues or to the nearest ventilating shafts.

There are two school-rooms, one at Arbour Hill, with accommodation for 240 men and three schoolmasters, and the other is an infant school for about 90 children. This latter school-room is situated in the ground floor of the Royal Square, and is very dark. It should be ventilated like the barrack-rooms, by a shaft and inlets.

There is one good "Queen's Library" on the eastern side of the Palatine Square. It is in the general court-martial room, and is inconveniently situated, inasmuch as it has to be reached by passing up a staircase belonging to officers' quarters.

There is a library and reading-room for the use of the troops at the cavalry gate.

An attic barrack-room over the stables behind the Royal Square is at present occupied as a regimental library. This room should be ventilated like the other attic barrack-rooms.

There are no day-rooms connected with any of these barracks.

There are four ablution houses, besides one room in the ground floor of the cavalry range which has been set apart for this object.

They are all supplied with slate benches and basins, with water laid on, and have accommodation for 108

men at one time. In a barrack of this size the ablution accommodation appears very inadequate, and such as it is, great inconvenience is experienced from the condition of the water supply, which is both very deficient in quantity and defectively distributed.

One of these ablution-rooms, with accommodation for 18 men, is situated in the ground floor of one of the cavalry ranges, and has barrack-rooms on both sides and above it. The ground below this room appears to be soaked with water, and the adjacent walls and floors are damp. The men's rooms above this ablution-room are unhealthy, and fever takes place in it.

It has been proposed to construct a proper ablution-room in place of the existing one; this ought to be done without delay, and the present ablution-room should be discontinued. Next to foul air, damp is one of the most influential causes of zymotic disease wherever bodies of men are massed together.

With regard to the other ablution-houses, they ought all to have additional light through the roofs, and wherever they require gratings, pegs, or forms, these should be supplied. It would be very advantageous also to increase the ablution accommodation at other points, to save time, and to diminish the amount of exposure of the men.

There is no bathing accommodation. One bath for every 100 men should be provided, and water laid on to it. Part of the required space might possibly be obtained in some of the present ablution-houses, but perhaps it would be more convenient and economical to build a proper bath-house in a central position.

These barracks are far behind one or two of the other Dublin barracks in their laundry arrangements. They have in fact no laundry at all. There are only three small women's wash-houses, very imperfectly provided with the most ordinary conveniences. They are not supplied with water, and this indispensable requisite for washing has to be carried a considerable distance. There are boilers, but no fixed tubs, and there are no means of drying or getting up linen. The foul water is removed by underground drains, which are untrapped. All the buildings are too dark.

It would be most advisable to construct a laundry similar to the one at Beggar's Bush, or Richmond barracks; but in the meantime we would recommend that the present buildings be better lighted through the roof, the drains trapped, water laid on and fixed tubs provided, and that a proper laundry and drying stove be put up in each house.

There are five cook-houses belonging to the different squares. At the time of our visit they had no other means of cooking except boilers, but it was stated to us that it was intended to introduce ovens. One ventilated roasting oven ought to be introduced into each house. Several of these cook-houses are not properly supplied with water. They are very narrow and inconvenient, and they are too dark. Additional light should be given to them by glass tiles in the roofs.

There are three armourer's shops; two shoeing forges, one saddler's shop; two shoemakers' shops, and three tailors' shops. There is ventilation in the tailors' shops by means of perforated panes, but it is not enough. They should have a shaft through the roof, and two inlets for air to each shop. The shoemaker's shop requires more light.

Water for the supply of all the squares is derived from two sources. One of these is a pond in Phœnix Park, and the other is pipe water from St. James's harbour. There are besides several pumps for raising water from springs and from rain-water tanks. The Phœnix Park supply is said to be very inconstant, and not to be depended upon. The pipe water supply does not rise high enough, and the practical result is, that the water supply of these large barracks is insufficient in amount, and the mode of distribution faulty.

Most of the privies, ablution-rooms, and wash-houses, for which the greater part of the water supply is required, are situated on the highest ground within the barrack enclosure, and to this highest level it is essential that water be laid on at pressure. If the Corporation water supply would not permit of this being accomplished, it would be advisable to construct a supply tank with pumping machinery on the high ground behind, and to lay the water on to all the barrack offices.

The buildings are all drained into the river Liffey, and the river occasionally emits very offensive smells when the tide is out and the wind blows over it to the barracks. The drains generally pass between the ranges of buildings. Some of them are not trapped.

All the privies are in a very defective state. They are drained and are intended to be flushed, but the water supply is so inconstant that this can only be done occasionally. The whole of these conveniences require to be reconstructed as proper water latrines, in which water should always stand. They should be provided with proper seats, having divisions between them, and half-doors, and the buildings should be thoroughly lighted and ventilated. Whatever improvement in the water supply may be required, to enable proper latrines to be constructed, should be carried out with as little delay as possible. All the untrapped drains and gulley grates should also be trapped.

The urinals are very defective, and ought to be reconstructed and supplied with water.

The arrangements for cleansing these barracks, especially the cavalry square, are far from being efficient. It appears to be the custom to throw the manure out of the windows of the upper stable ranges into a narrow back alley, under the barrack-room windows, from whence it is swept up imperfectly and removed, and generally speaking the surface of the square near the stables was not so clean as it might have been. The manure is removed daily before 11 o'clock, which is a very proper proceeding; but in order to derive all the advantages accruing from a daily removal of the manure, means should be adopted for keeping the surface clean in the interval. It appears to us that possibly the best way of doing this would be to provide a sufficient number of barrows or boxes, into which the manure could be thrown, and which could either be emptied by the contractor, or taken away by the men to some general receptacle outside the barrack enclosure.

A similar method of procedure ought to be adopted with the ordinary barrack refuse which at present is accumulated in large ash-pits in confined situations among the buildings.

We would advise that the whole of these ash-pits be abolished, and iron carts placed in convenient situations, into which the ashes and other matters might be thrown and removed daily. The great principle of health and cleanliness to be kept in view is, to permit no accumulation of decomposing matters in the vicinity of barrack-rooms, and more especially in such close confined positions as those behind these squares.

Besides the sanitary defects above described, there are several deficiences in the barrack accommodation which we may here refer to.

There is no accommodation for married soldiers; and at the period when the return was sent to us there were accommodated in barrack-rooms in the Palatine Square 51 women and 61 children. In the Royal Square barrack-rooms there were 15 women and 27 children; and in the rooms of the Cavalry Square there were 21 women and 21 children. The married women belonging to the Guards are generally in lodgings outside. An excellent commencement has been made in supplying the Dublin barracks with married quarters at Beggar's Bush and Richmond barracks, and we trust that ere long the large force in the Royal barracks will have a suitable proportion of married quarters provided for them also.

It is stated that quarters are required for six schoolmasters or schoolmistresses.

The serjeants' mess-rooms are stated to be too small. In the Royal Square the serjeants' mess and quarter-masters' stores are very dark. The rooms used as offices in the Palatine Square are complained of as being very dark, in consequence of the small size of the windows and the thickness of the walls. This inconvenience can only be remedied by removing the offices to a more suitable building.

There are no cleaning-rooms and no covered drill sheds. The arcades round the squares afford some of the shelter required, but they are very narrow.

There are five guard-rooms belonging to the different squares.

The royal main guard-room has an Arnott's ventilator in the chimney ; it requires an inlet for air. The adjoining lock-up room requires a shaft and inlet. The cells also require more ventilation by a shaft.

The cavalry guard-room and the lock-up room require each a shaft and inlets.

The Royal Square guard-room should have an additional window, and should be ventilated by a shaft and inlet. The lock-up room requires similar means of ventilation.

Ventilation is required for the canteen tap-room by a shaft and inlet of the usual construction.

*The following is a Summary of the Sanitary Improvements required for the Royal Barracks :—*

1. Reduction of the number of men in all the barrack-rooms to the extent specified.

2. Raising the roofs of the cavalry attics, and enlarging the windows to give additional light and air. Opening additional windows, or enlarging windows in the darker rooms of the squares wherever it is practicable to do so.

3. Ventilation of all the corridors leading to the barrack-rooms in the squares by perforated glass panes in the upper sash of each window. Carrying a large louvre shaft from the top of each staircase to above the roof of the range.

4. Ventilating all the barrack-rooms and the infant school-room by a shaft carried from the ceiling to above the roof, and by an inlet to the open air, protected within the room by a perforated zinc cornice for diffusing the air.

5. Ventilating the attic barrack-rooms over the cavalry stables by louvres through the ridge, and inlets at the eaves, as described. Ventilating the stables under these rooms by shafts carried up from each corner to above the roof. Ventilation of the guard-rooms, lock-up rooms, and cells by shafts and inlets as suggested. All the barrack-room and guard-room grates to be remodelled to save heat. All flagged floors in barrack-rooms to be boarded over, or the flags to be removed and wooden floors laid down.

6. All the gas-burners to be ventilated by funnels and tubes carried into the nearest chimney or ventilating shaft.

7. Ablution-room under the barrack-rooms in the cavalry range to be removed ; ablution accommodation to be extended. Ablution-rooms to have additional light through the roof, and pegs and gratings where required. Water to be laid on.

8. A bath-house, with one bath to every 100 men, and water to be laid on.

9. Present women's wash-houses to be provided with fixed tubs and water laid on, laundry and drying stoves, and light through the roof.

10. A ventilated roasting oven to be provided for each cook-house, and more light to be given through the roof.

11. Tailors' workshops to be ventilated through the roof, and shoemakers' shops to have more light.

12. Water supply to be extended and laid on over all the barracks.

13. All the privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation. Urinals to be reconstructed and supplied with water. All untrapped drains and gulley grates to be trapped.

14. Ash-pits to be abolished, and iron carts substituted. Stable manure to be collected and removed in barrows.

## II.—ARBOUR HILL BARRACKS.

These barracks consist of a few very bad rooms, chiefly in an old disused provost establishment. The buildings are two stories high, the upper flat being reached by an outside stair. There are on the construction four soldiers' rooms for cavalry and two for infantry, the accommodation in which is shown in the following table:—

| Rooms. | Total present Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Cavalry: | | | |
| 1 - | 16 | 9 | 7 |
| 1 - | 12 | 9 | 3 |
| 1 - | 10 | 6 | 4 |
| 1 - | 22 | 12 | 10 |
| Infantry: | | | |
| 1 - | 6 | 4 | 2 |
| 1 - | 25 | 15 | 10 |
| Total - | 91 | 55 | 36 |

The buildings are situated on comparatively high ground behind the Royal barracks, and are in two blocks, each two stories high, one facing the road, the other in the provost yard behind. Along the opposite side of the road and extending down the slope towards the Royal barracks are a range of cavalry stables. In their present state the buildings are unfit for barrack-rooms. They are dark, gloomy, overcrowded, unventilated, and destitute of any appearance of comfort. They are in fact more like the old style of common rooms of prisons than barrack-rooms

We are of opinion that they ought not to be used for barracks, and that to make them suitable for such a purpose, an outlay of money would be required more than the premises are worth. One of two courses should be followed. Either they should be evacuated, or if this be impossible at present, the smallest possible amount of outlay ought to be incurred in removing the defects likely to injure the heath of the men in them.

And, first. The maximum number of men in these rooms should on no account exceed 55, that is 36 cavalry, and 19 infantry. In this case 600 cubic feet is too small an allowance for health, and we have given a fraction over the amount in each case except one.

Secondly, every room must have more window space. Closed windows where they exist should be re-opened, and additional windows and skylights introduced.

None of the rooms are ventilated, and we would recommend a shaft and two inlets to be provided for each of the rooms, except for the six-men room, which will require a shaft and one inlet only.

The privy accommodation is very bad, and in a noxious state. Water latrines properly drained, with divisions of seats, half-doors, light, and ventilation, should be substituted for the present arrangements. The buildings are deficient in many other conveniences and requisites ; but, in the hope of their being given up at no distant date, *we should recommend :—*

1. Removing all the men out of them, except 55.

2. Opening additional windows and skylights, and ventilating the rooms by shafts and inlets.

3. Reconstructing the privies as water latrines with drainage.

## III.—ISLAND BRIDGE CAVALRY BARRACKS.

Island Bridge barrack is situated on the south-western side of Dublin, close to the river Liffey. The village of Island Bridge adjoins it at one corner, otherwise the situation is open, but as compared with the surrounding district it is low and damp.

The area within the barrack enclosure is 7A. 3R. 37P. The subsoil is argillaceous.

The barracks consist of two parts, one old, the other of quite recent construction. The older part is built of brick, the newer part of stone. They differ so materially in their condition that it is necessary to report upon them separately.

### 1. *Old Barrack.*

This portion of Island Bridge barrack is built in the form of a square. Nearest the principal entrance are the officers' quarters, cook-house, &c., forming the higher side of the square, and, sloping downwards from these, are on one side stables with barrack-rooms over them, and on the other privies, officers' stables, and a line of barrack-rooms two stories high. The lower side of the square is formed by stables, barrack-rooms, the canteen, &c.

The whole of the buildings are of an old, inconvenient construction, and are a very inferior specimen of a cavalry barrack.

The rooms over the stables are reached by narrow stairs between the stables. They are low in the roof in proportion to their length. The windows are very small, being no more than from 2 feet 6 inches to 3 feet high, and from two to three feet in width, so that the interior of the rooms is gloomy and uncomfortable.

There are in all 19 soldiers' rooms and six staff-serjeants' rooms. The total regulation accommodation is for 416 non-commissioned officers and men, the details of which are given in the following table :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 31 | 27 | 4 |
| 2 | 25 | 19 | 6 |
| 3–4 } 5–6 } | 144 | 108 | 36 |
| 7 | 30 | 23 | 7 |
| 8 | 24 | 18 | 6 |
| 9 | 6 | 6 | — |
| 10 | 24 | 18 | 6 |
| 11 | 30 | 23 | 7 |
| 12 | 4 | 4 | — |
| 13 | 2 | 2 | — |
| 14 | 19 | 15 | 4 |
| 15 | 14 | 11 | 3 |
| 16 | 12 | 9 | 3 |
| 17 | 17 | 13 | 4 |
| 18 | 16 | 13 | 3 |
| 19 | 12 | 9 | 3 |
| Total - | 410 | 318 | 92 |

The preceding table shows a deficiency of accommodation for 92 men over the existing regulation, but the table does not show the actual amount of overcrowding, for at the time the return was made to us, there were 48 men in the rooms over and above the regulation number, so that the actual excess of occupants amounted to 140 men.

The 19 rooms ought on no account to accommodate more than 318 men, in the proportions per room given in the table. It is the maximum number that should be placed in such a barrack.

Bad as the rooms are, none of them are efficiently ventilated. There are a few holes in the ceiling into the roof, and some of the ridge tiles are raised, but this is by no means enough. To ventilate the building we must begin with the stables beneath, for at the present time every room is permeated by a strong stable odour. This is partly owing to defective ventilation, and partly to the fact that the stables and the surface outside are pitch paved, which is the worst form of pavement to adopt when surface drainage and cleanliness are aimed at. The whole of the paving should be relaid with close fitting square setts at the earliest opportunity ; every stable should be ventilated by a shaft carried up from the ceiling at each of the four corners of the stable to above the roof, where it should terminate in a louvre. The united area of the four shafts should give 12 square inches per horse ; besides the shafts, panes of perforated glass should be introduced into each stable window to supply air.

The barrack-rooms require shafts and inlets of the usual construction and dimensions. All the rooms under 40 feet in length will require one shaft and two inlets ; and all the longer rooms will require two shafts and four inlets. The single shaft may be carried up at the end of the room opposite the door, to terminate in a louvre above the ridge. In the rooms where there are two shafts, they ought to be carried up from the centre line of the ceiling at about a third of the length of the room from each end to above the ridge. The inlets ought to be placed close to the eaves, half on each side the room.

There are two or three ways of providing the necessary increase of light ; one by having a sufficient number of skylights, another by carrying the windows dormer fashion above the eaves, or by raising the roof and increasing the height of the walls, and, consequently, of the windows ; but it is questionable whether this last would not cost more than the building is worth.

In one or other of these ways the barrack-rooms over the stables ought to have increased light, for at present they are most deficient in this respect.

These, however, are not the worst rooms in this barrack ; the two-story rooms on the opposite side of the square adjoining the officers' stables are amongst the worst specimens of barrack-rooms we have seen. The range is built against a steep sloping bank, and the rooms have only one window. They are dark and miserable, and should, if possible, be devoted to some other purpose than for soldiers' quarters. There are one or two rooms on the ground-floor of the stable ranges nearly as bad. All of them require additional windows to make them sufficiently light for occupation, and wherever an additional window can be put in, or an existing window enlarged, it should be done.

All the staircases and upper passages should be lighted by ventilating skylights.

All the fire-grates are of the old construction, and ought to be replaced by improved grates, for economizing fuel, and warming a portion of the air admitted.

The barrack-rooms are lighted with candles. There is gas at no great distance, and if it can be conveyed to the barrack at a moderate cost, we should recommend ventilated gas-burners to be introduced into every barrack-room.

There are two ablution-rooms, one of which is built out into the square, but connected with the range by a passage. These rooms have slate benches, with basins and water laid on ; there are no pegs, and the rooms are rather dark.

At present there are no baths, but four baths are provided in this year's estimates.

There is no women's wash-house. A small laundry with fixed tubs, boilers, and a drying-room with means of ironing linen ought to be provided.

There are married soldiers' quarters, which appear to have been formed out of an old stable boarded over. The place has windows only on one side, and is dark

and uncomfortable. There are several families in it. This room ought to have two ventilating shafts carried up from the ceiling close to the back wall, and two inlets for air over the windows.

The cook-house of this barrack is supplied with boilers; it has no other means of cooking, and it is too dark. It requires a ventilated roasting oven and additional light through the roof.

Water is obtained from a rain water tank, and from four pump wells. The supply is very defective, and ought to be improved, both as to its sources and method of distribution.

The sewerage is in a very defective state, and all the privies are connected with cesspits. They were in a most offensive condition when we inspected the barracks. They should be drained and reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation, and the present cesspits filled up. The urinals ought at the same time to be reconstructed and supplied with water.

This old barrack is deficient in some essential requirements; it has no day-room or library. It has, properly speaking, no school-room, except an attic barrack-room, used both for soldiers and children, and requiring light and ventilation like the barrack-rooms. It has no cleaning-room, and no drill-shed.

The canteen accommodation is by no means good; the tap-room is dark and unventilated. It needs an additional window, and a silk flap ventilator into the chimney, with perforated glass panes in the windows.

Better arrangements are required for removing the manure and other barrack refuse. The dung-heaps are at present directly in front of the windows of the men's rooms; they should be removed from their present position to a greater distance, and the manure taken away more frequently. The ash-pit ought to be abolished, and the barrack refuse collected and removed daily.

This barrack as a whole is extremely defective, and would necessitate a large outlay of money to make it correspond to the new barrack adjoining. It ought to be gradually rebuilt on a better and more complete plan, but in the meantime *the following necessary sanitary improvements ought to be carried out:—*

1. The number in each barrack-room should be reduced to the extent pointed out in the preceding table.
2. Each barrack-room should be ventilated by shafts and inlets for air in the manner described. The married quarters and school-room should be similarly ventilated; the window space in all the rooms should be increased in one of the methods pointed out. Ventilation and lighting should be afforded to the stairs and upper passages by skylights. Remodelled fire-grates to be put up in the rooms. Canteen tap-room to have more light, and to be ventilated by a silk flap ventilator and perforated panes.
3. Gas to be introduced, and ventilated gas-burners to be placed in each barrack-room.
4. Stables to be ventilated by a shaft carried up from each corner to above the roof of the buildings, and by perforated panes in the windows.
5. One of the ablution houses to have pegs put up and more light. Four baths, with water laid on, to be provided.
6. Cook-houses to have ventilated roasting-ovens, and more light through the roof.
7. A suitable laundry to be erected for the whole barrack.
8. The barrack to be properly drained, all the cesspits abolished, and the privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation. Urinals also to be reconstructed and supplied with water.

Surface drainage to be improved by paving the stables and ground along the barrack ranges with square sets and proper channelling.

9. Manure heaps to be removed to a distance from the men's rooms, and manure to be more frequently taken away. Ash-pits to be removed, and arrangements made for the daily collection and removal of the barrack refuse by iron carts.

### 2. *The New Barrack.*

This portion of Island Bridge barrack is separated from the old part by a narrow public roadway, across which there is an arch with a covered passage above, connecting the barracks. It has been recently completed, and consists of three ranges of barrack-rooms over stables, parallel to each other, and having paved courts between them.

There are in all six soldiers' rooms, each of which is 56 feet long, 27 feet 6 inches broad, and 11 feet high. They are reached by wide stone stairs, the ventilation of which should be improved by introducing panes of perforated glass in the stair windows. Each room has 12 lofty windows, 6 on each side, and the regulation accommodation is for 28 men per room, giving 605 cubic feet per man. These rooms, whether as regards their proportions, lightness, amount of cubic space for the men, or their general appearance of cleanliness and comfort, afford a most striking and favourable contrast to the rooms in the older part of the barrack, and indeed to those in most other barracks we have visited.

We are glad to be able to state that provision has been made in the construction for ventilating the rooms and stables. Each room has two air shafts, one at either end, carried up in the chimney stalk. They have each an area of 54 square inches, with openings at the ceiling. The sectional area of the shafts is rather small, and the openings into them are not large enough in proportion to the area of the shafts. In order, therefore, to give the full effect of the shafts, the openings should be enlarged to an area double of that of the shaft, and they should be covered by a wide open grating.

Four inlets for air, close to the ceiling, each with an area of 54 square inches, have also been provided for each room. They are placed in the corners. It would have been better to have arranged them along the side walls, on account of the more equal diffusion of the inflowing current that might have been secured, but we do not think it necessary to move them. Their area should, however, be enlarged to half as much again, unless the grates were remodelled to admit warm air, which would be preferable, and in either case the openings should be covered inside with perforated zinc diffusing cornices. Over each door is a swing window 18 inches square, which affords additional facilities for ventilation.

The rooms are now being provided with gas-burners. Each of them should have a ventilating funnel and a tube carried into the nearest chimney. Common fire-grates are in use for warming. They might be remodelled to warm part of the inflowing air.

Ventilation is obtained for the stables by shafts carried up in the walls. Additional inlets for air are required, and might be obtained by panes of perforated glass in the stable windows.

A good ablution-room has been provided, but it is rather dark and requires a skylight.

There are no baths. It was suggested that possibly sufficient accommodation for bathing might be obtained in the river Liffey, but this river is a tidal stream where it passes the barrack, and moreover it receives the barrack drainage. It would be better to provide a proper bath-house for the whole of Island Bridge barrack, and to put up one bath for every 100 men, with water laid on.

One cook-house has been provided for the new barrack. It has a brick oven heated with wood, which is stated to be an unnecessarily expensive method. It might be well to alter this oven, to enable the baking to be done with coal. The cook-house is ventilated through the roof, but not sufficiently so. The louvre should be enlarged, and a few panes of perforated glass should be introduced into the windows.

Water is derived from one pump. The supply is

very deficient, and requires to be improved, along with that of Island Bridge barrack generally.

The drainage is effected by earthenware pipes and brick sewers. It is of no use as regards the privies, which, although drained, have on account of their defective structure to be cleansed by hand labour.

These privies require to be enlarged and reconstructed as water latrines, with divisions of seats and half-doors, and with sufficient ventilation and light. The urinals have no water for cleansing; they should have a supply laid on for the purpose.

There is no day-room nor drill shed; there is no laundry. A suitable building, provided with means of washing, drying, and getting up men's linen, is much required.

The guard-room requires ventilation by a shaft and inlet for air.

There is a manure heap and ash-pit. The entrance to the former is too narrow for a barrow to pass in, and the manure has to be thrown down outside and forked in, thereby occasioning unnecessary nuisance and trouble. The ash-pit ought to be removed, and all barrack refuse collected and carted away daily in iron carts.

*The following Sanitary Improvements are required for the New Part of Island Bridge Barrack:—*

1. Enlarging the openings into the foul-air shafts in the soldiers' rooms to double the sectional area of the shaft, and protecting the opening by a grating. Enlarging the inlets and covering them with perforated zinc diffusing cornices. Ventilating the staircases by perforated panes in the windows. Guard-room to be ventilated by a shaft and inlet. Improving the ventilation of the stables by perforated panes in the windows. Barrack-room and guard-room grates to be remodelled.

2. Increasing the light in the ablution-room by a skylight, and providing baths with water laid on.

3. Additional ventilation to be given to the cook-house by enlarging the louvre and by perforated panes in the windows.

4. Water supply to be improved along with that of the old part of Island Bridge barrack.

5. Privies to be enlarged and re-constructed as water latrines, with divisions of seats, half-doors, light, and ventilation.

6. A wash-house, with fixed tubs and water laid on, and means of drying and getting up linen, to be provided.

7. Barrack refuse to be removed daily, and the ash-pit abolished. Entrance to dung-pit to be enlarged.

## IV. SHIP STREET BARRACKS.

Ship street barracks are situated close to Dublin castle, within an enclosure 1A. 1R. 33P. in extent. The immediate neighbourhood on two sides is densely populated, and the barracks are separated from the neighbouring houses by narrow filthy streets. The tenants in Ship street, immediately under the barrack windows, are said to keep pigs behind their houses, and the nuisance arising from them is experienced in the barrack-rooms, especially when the manure is being removed. If there are legal means of preventing such nuisances, the law should be put in force.

The ground on which the barracks are built is yellow clay over limestone, and the buildings are chiefly of brick, and are of recent construction. The soldiers' quarters are principally situated in a long range of buildings forming one side of Great Ship street, with the officers' quarters at one end of the range. Behind these quarters is the barrack parade ground, on the opposite side of which are some large soldiers' rooms, formed out of an old store. The barracks are about to be extended over a site at the angle of Great Ship street and Upper Stephen street. The position occupied by the whole establishment is not a very good one, and the external ventilation of all the buildings is defective. The situation is considered to be very unhealthy, a circumstance which renders it all the more necessary to put the buildings themselves in a good sanitary condition.

The soldiers' quarters are in eight houses, erected at different times, and differing considerably from each other in structure. Some have good stone staircases and light cheerful rooms, with windows on both sides. Others are back to back, with windows only on one side; while the accommodation in the older houses is of a very inferior description. There are 41 barrack-rooms on the present construction, but several of these rooms are ultimately intended for non-commissioned officers.

The largest rooms are in the old store; they are in two flats, and are divided down the middle in the length way by a wall perforated with arches. These rooms are not so good as those in the front buildings.

All the rooms are overcrowded, but not to such an extent as we have found them in other Dublin barracks.

The following table shows the present regulation number of men allowed to each room, with the excess over what the number would be at 600 cubic feet per man.

| Rooms. | Present Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| E. 1, 4 | 16 | 10 | 6 |
| 2 | 16 | 9 | 7 |
| 5 | 8 | 3 | 5 |
| 6 | 8 | 4 | 4 |
| 7 | 8 | 4 | 4 |
| F. 3 | 16 | 9 | 7 |
| 4 | 6 | 4 | 2 |
| 5, 7 | 16 | 6 | 10 |
| 6 | 8 | 4 | 4 |
| G. 1 | 8 | 6 | 2 |
| 3 | 16 | 9 | 7 |
| 4 | 8 | 5 | 3 |
| 5, 6 | 16 | 8 | 8 |
| 7 | 8 | 3 | 5 |
| H. 3, 4, 8, 9 | 56 | 40 | 16 |
| 6, 7 | 48 | 34 | 14 |
| 11, 12 | 48 | 34 | 14 |
| I. 1, 3 | 22 | 18 | 4 |
| 2, 4 | 36 | 32 | 4 |
| K. 1, 6 | 32 | 24 | 8 |
| 5, 8 | 26 | 24 | 2 |
| 9 | 16 | 12 | 4 |
| L. 1, 4 | 32 | 28 | 4 |
| 6 | 16 | 13 | 3 |
| M. 1 | 50 | 36 | 14 |
| 2 | 53 | 44 | 9 |
| 3 | 7 | 5 | 2 |
| 4 | 10 | 7 | 3 |
| Total | 610 | 435 | 175 |

The present rooms will accommodate 435 men and no more. There are no misappropriations, and there were no vacant rooms at the time the return was made to us.

A number of the rooms have foul air shafts carried up in the chimney stalks, and inlets for air. They were not acting efficiently at the time we examined the rooms. The size of both outlets and inlets appeared to be too small. We would propose to remedy this deficiency by enlarging the opening of each shaft in the rooms to double the section of the shaft, and to provide an additional inlet by remodelling the fire-grate, with a chamber for warming part of the air.

In rooms where there are no shafts and inlets provided, a wooden shaft will have to be carried up from

the ceiling to above the roof of the buildings, and one or two inlets, according to the size of the rooms, will have to be made in the walls, one on each side. Some rooms have shafts and no inlets ; in these the latter should be introduced.

All the staircases should also be ventilated by shafts carried from the top above the roof, and by perforated glass panes in the windows.

The large lower rooms in M house will require two shafts and four inlets, and the large upper rooms will require two louvres through the ridge and four inlets. In each case the inlets should be placed two on each side of the room. The fire-grates in these rooms, and also in the library and reading-room, should be remodelled on the same plan as in all the other rooms.

Each serjeant's room should have a silk flap ventilator in the chimney, the fire-grate being contracted below to increase the current. The serjeants' mess should also be ventilated by a shaft and inlets of the usual form.

Gas is used for lighting the barrack square, but the rooms are all lighted by candles. We would recommend a ventilated gas-burner to be introduced into each barrack-room, as also into the library and reading-room, and the school-rooms.

There are two school-rooms, one for adults, and one for children. The former is an excellent building of recent construction ; it is lofty, light, and cheerful ; it has some provision for ventilation, but requires inlets for air in the side opposite the windows. The infant school is a small room in the old part of the front range of buildings. It is situated in what appears to have been formerly a private residence ; it is very confined and gloomy, and has no means of ventilation. It should have a shaft and inlets like the barrack-rooms.

At the lower end of the parade ground there is a building two stories high, with an outside stair to the upper story, which contains the ablution-room of the barracks, the lower story containing the women's wash-house.

The ablution-room has slate benches without ledges, 20 basins and water taps ; it has no gratings for the feet, nor pegs to hang clothes on. At the end of this room, and without any separation, there is a slate bath. The ablution table should have a ledge, and gratings and pegs should be provided. The bathing accommodation is insufficient, and one bath for every 100 men should be provided. As this ablution house is at a considerable distance from some of the rooms, it might be advisable to provide both ablution and bath accommodation, by increasing the number of baths in the present ablution house, providing at the same time that they be properly separated from each other, and from the part where the men wash, and then a small ablution-room might be constructed at the upper end of the parade ground in connexion with the new barrack buildings about to be erected there.

The women's wash-house has boilers and water taps supplied from the city waterworks ; but it has no fixed tubs, and no means of drying or getting up linen. Under the floor is a tank from which water can be raised by a pump. It appears that foul water finds its way into this tank and becomes putrid ; at all events the water raised from it by the pump is most offensive, and unfit for any purpose whatever.

The tank should either be repaired so as to preserve its contents from contamination, or if it be not required, it should be done away with.

The cook-houses are situated in the basement of the front line of barracks. For the greater part of their height they are below the level of the ground, and are imperfectly lighted and ventilated. We would propose to remove the latter of these defects as far as practicable by filling the upper rows of panes in all the windows with perforated glass. The lighting does not admit of being improved.

There are two good ovens in one of these cook-houses.

In the basement opposite the kitchen windows, and three or four feet from them, there are very objectionable ash-pits situated under the parade ground. In such a position, directly under the windows of the men's rooms, it is highly objectionable to permit any accumulation of decaying matters. These ash-pits ought to be abolished, and the barrack refuse collected in an iron cart, or if there be not room for a cart, in iron hand barrows or boxes, and removed daily.

Water at pressure is obtained from the city works, and the supply appears to be sufficient.

All the buildings are drained. None of the drains pass under the barracks, and all are stated to be trapped and sufficient.

There are three privies for the troops. They are drained, and washed out with water, but this is not enough. They should be converted into proper water latrines, and have divisions of seats, half-doors, light, and ventilation.

There is a good urinal, supplied with water, but, from a defect in the surface drainage, urine was lying in the gutters. This should be remedied.

Ship street barracks are deficient in the following accommodation :—There is no day-room, cleaning-room, drill shed, nor accommodation for trades. And there are no married quarters. At the time the return was made to us 42 women were accommodated in barrack-rooms.

*The following are the Sanitary Improvements we would recommend to be carried out :—*

1. Reduction of the number of men in the barrack-rooms to the extent pointed out.

2. Improving the ventilation in the rooms which have shafts and inlets, by enlarging the opening of the foul air shaft to double the section of the flue, and by replacing the covers of the inlets by perforated zinc. Rooms with shafts and no inlets to be provided with inlets. Rooms with neither shafts nor inlets to be provided with both. Stairs to be ventilated by shafts from the top ceiling, and by perforated glass panes in the windows. Ventilation of the library and reading-room, and of the adult and infant school-rooms to be improved as described. Serjeants' room to have silk flap ventilators in the chimnies, and improved grates. Serjeants' mess to be ventilated by a shaft and inlets. Kitchens to have panes of perforated glass in the windows. All the barrack-room grates to be remodelled.

3. Ventilated gas-burners to be introduced into all the rooms.

4. Ablution-room to have pegs and gratings, and a ledge to the table. Additional baths to be provided in the proportion of one bath to every 100 men.

5. Women's wash-house to be provided with fixed tubs and a drying and laundry stove. Water tank in the floor to be repaired or removed.

6. Privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation.

7. Ash-pits to be removed, and provision made for the daily collection and removal of barrack refuse.

*Ship Street Barrack Hospital.*

This hospital is a large private residence at the higher end of the enclosure, with a front to Upper Stephen street. The rooms are good, at least for a house of the class, but hardly sufficiently light and airy for hospital wards. They are in three flats, with a deep dark basement, and there is a dark well staircase running up the centre of the house, giving access to the rooms on different flats. Eight of these rooms are used for wards, and a room in the attics is used

as an itch ward. The following table shows the accommodation in the sick wards.

| Wards. | Regulation Accommodation. | Accommodation at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 8 | 5 | 3 |
| 2 | 6 | 4 | 2 |
| 3 | 4 | 3 | 1 |
| 4 | 8 | 5 | 3 |
| 5 | 8 | 5 | 3 |
| 6 | 5 | 3 | 2 |
| 7 | 5 | 3 | 2 |
| 8 | 4 | 2 | 2 |
| Total - | 48 | 30 | 18 |

There is space for 30 sick, at less than 1,200 cubic feet each.

Some of the wards have an Arnott's ventilator in the chimney, and a small opening over each door, but the ventilation is not sufficient. We would recommend that each ward should have a shaft carried up from the ceiling to above the roof, and that one inlet should be made to the open air close to the ceiling of each room.

The staircase has means of ventilation at the skylight, if they be properly used.

The kitchen is dark and unventilated; it ought to have panes of perforated glass in the windows. There is a boiler and oven, but the cooking range is not a very good one.

There is a dark, damp ablution house in the basement; it has a bath, with hot and cold water laid on. It has gratings, but no pegs.

As this house has not the conveniences necessary for a hospital, and could not be supplied with them unless at great outlay, we shall restrict our recommendations chiefly to what can be readily done at a small cost.

1. The numbers of beds should be reduced to the extent stated above.

2. The wards should be ventilated by shafts and inlets as described, and the kitchen should have perforated glass panes in the window.

3. A few pegs should be put up in the lavatory to hang the men's clothes on while washing or bathing.

## V. PORTOBELLO BARRACKS.

These barracks are situated at the outskirts of the city of Dublin, in an open suburban position, with only a few private houses in the vicinity. They stand within a large enclosure 28A. 2R. 20P. in extent. The site is about 83 feet above low water-mark, and the subsoil is clay and gravel. The grand canal, from which part of the water supply of the barracks is derived, passes within 90 feet of the entrance. The buildings are of stone, and were erected, some of them 50, some 30 years ago. They consist of eight blocks, arranged in squares with the angles open, and, so far as the general plan is concerned, the whole of the buildings admit of free external ventilation. Half of them are occupied by cavalry, and half by artillery. Part of the ranges consist entirely of barrack-rooms, but 300 men are accommodated in rooms over stables. There are 40 barrack-rooms in the permanent buildings, and there are besides eight corrugated iron huts with regulation space for 25 men each. The total regulation accommodation, including these huts, is for 928 non-commissioned officers and men.

The particulars of the accommodation are given in the following table:—

| Rooms. | Total Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 12 | 300 | 288 | 12 |
| 7 | 105 | 77 | 28 |
| 4 | 60 | 44 | 16 |
| 2 | 30 | 22 | 8 |
| 5 | 70 | 55 | 15 |
| 2 | 28 | 22 | 6 |
| 2 | 28 | 22 | 6 |
| 2 | 28 | 18 | 10 |
| 2 | 28 | 18 | 10 |
| 1 | 8 | 8 | — |
| 1 | 2 | 2 | — |
| Total - | 687 | 576 | 111 |

By dividing the space in these rooms as nearly as may be into portions of 600 cubic feet, we find that all, with two exceptions, contain more men than they ought. The least overcrowded are the long rooms over the stables (the 12 first rooms in the table). By removing one man out of each of these rooms, a trifle less than 600 cubic feet would be given to the remainder. Out of each of the 13 15-men rooms (those in the three next lines of the table), four men will have to be removed. Three men will have to be removed out of each of the nine 14-men rooms (those in the next three lines in the table); each of the following four 14-men rooms has space for only nine men, so that five men will have to be removed from each. The total deficiency of accommodation amounts to 111 men.

The overcrowded state of the rooms, and the want of ventilation, keeps the air always in a close offensive state, and it is stated to become perfectly intolerable at night, especially during warm weather. This condition of the air is a fruitful source of disease in these barracks, as it is in others, and can only be prevented by giving the men a sufficiency of cubic space and abundant ventilation.

The eight corrugated iron huts ought by regulation to accommodate 25 men each, 200 in all; but in our opinion the number has been wisely restricted in practice to 18 men per hut, at which number we propose to fix the regulation accommodation. They will hold 144 men, but no more.

The rooms over the stables are entered by a staircase, at the top of which is a non-commissioned officer's room. Two barrack-rooms enter right and left from the top of the stair; they are each 52 feet in length, and have two fireplaces, one at each end, and four windows, two on either side. The amount of window space is very small in proportion to the size of these rooms, but in the walls of each room there are two blind windows, which could be easily opened so as at once to increase the light; this we would recommend to be done.

Each room has two of Arnott's ventilators, one opening into each chimney; but, as it is an indispensable condition to the action of these ventilators that the opening from the fireplace into the chimney should be contracted to the greatest possible extent, while all the existing fire-grates are of the large old model, the chimney valves are of very little use. We are of opinion that the fire-grates throughout these barracks should be remodelled to save heat, but even were this done the amount of outlet which the chimney valves would supply would be insufficient to afford the required ventilation.

We would recommend that in addition to the valves in these rooms over the stables, there should be two air shafts carried up from the centre line of the ceiling to above the ridge of the roof, and that four

inlets for air, of which there are none at present, should be provided, two on either side of each room, close to the ceiling, and covered within the room by perforated zinc cornices for diffusing the current.

The staircases should likewise be ventilated by panes of perforated glass in the upper sashes of the windows. While the barrack-rooms over the stables are being ventilated, provision should be made for preventing the fumes from the stables from entering the rooms above. To effect this object shafts should be carried from the stables to above the roof, and the shafts should be carefully lined with soldered zinc. The stables themselves require more light, and perforated glass panes for the windows. The stables and the surface outside are paved with pitch paving ; it is a bad material for the purpose, and its use in the present case, no doubt accounts for the fact that the surface was far from being clean. Indeed it is hardly possible to keep such pavement dry and free from filth ; and we would advise, that as repairs are required, the whole should be relaid with carefully fitted square setts.

In all the 15 and 14-men rooms there are two fireplaces, one of which only is used. There are chimney ventilators in these rooms, but for the reasons already stated they are inefficient.

Ventilating shafts can very easily be supplied to all of these rooms by blocking up the fireplace of the disused chimney, and by making an opening into the chimney flue close to the ceiling of the room. The opening should have an area double that of the flue, and should be covered by an open grating. Each of these rooms requires, in addition, two inlets for air, one on either side, similar to those already described. The staircases should also be ventilated by perforated panes in the windows. One 8-men room, with only one fireplace, will require a shaft carried up from the ceiling to above the roof, and one inlet for air.

All the non-commissioned officers' rooms will be sufficiently ventilated by silk flap ventilators into the chimnies.

Ventilation should also be provided for the huts by a louvre in the ridge, through the middle of which the stove pipe should pass.

The ventilating area of this louvre should be 12 square inches per man.

All the barrack-rooms are lighted with gas, but none of the burners are ventilated. A funnel and tube should be placed over each burner, to convey the effluvia to the nearest chimney or ventilating shaft.

There are three ablution-rooms with benches, basins, and water laid on. An additional ablution-room has been estimated for this year ; it is very much wanted, and should be constructed without delay. One of the present ablution-rooms would be improved by a little more light, and all of them require more pegs. There are at present no baths. One has been estimated for, but at least eight will be required for the barrack.

There are two women's wash-houses, with boilers and benches, but they have no fixed tubs, and no means of drying or getting up linen.

In a barrack of this size it would be very advisable to construct a proper laundry, with the needful conveniences. If this cannot be done at once we should recommend that fixed tubs, with water laid on, should be provided in both the women's wash-houses ; that a drying and laundry stove and gratings for the feet be introduced into each, and additional light be provided.

There are four cook-houses with boilers ; one of these has an oven, but not a good one. An oven for each has been provided for in the estimates, and should be supplied.

Water for the barrack is supplied partly from the adjacent canal. It is filtered and raised for use by six pumps. There are 13 pumps supplied by water from wells. Neither source of supply can be considered good. Canal water is more or less stagnant, and liable to contract impurities ; and subsoil strata, into which has percolated the drainage from stables, manure heaps, privies, &c., is certainly not a water source which ought to be preferred. It would be better, if practicable, to introduce the city supply, as has been done at Beggar's Bush barracks, and to lay it on over the whole buildings under pressure.

The barracks are drained by stone, brick, and glazed pipe drains. None of them pass under the buildings. The sewers appear to be of very little use, so far as the privies are concerned, for these are in a most offensive and noxious condition. The privies on the cavalry side are connected with large cesspits behind and within the boundary wall. Those on the artillery side are close behind the barrack range, and have also cesspits into which their contents are received. The effluvium from them is traceable across the court to the nearest barrack-rooms, and the medical officers report that a great number of cases of illness, including typhoid fever, are traceable to these effluvia. The injury accruing to the health of the troops has been very properly and urgently represented by the medical officers of the royal artillery, but hitherto without result.

We are decidedly of opinion that all these cesspits ought to be abolished, and that the privies should be converted into water latrines and properly drained. Except this be done, there is no hope of remedying the present evil. There are altogether seven privies requiring drainage and reconstruction. The urinals are also very offensive. They should be properly drained and reconstructed with slate divisions, and water laid on for cleansing.

There are two libraries. The one on the artillery side is rather small. Both require ventilation by a shaft and inlet.

There are two non-commissioned officers' mess-rooms, with kitchens attached ; they each require ventilation by a shaft and inlet, and an oven for the kitchen.

The tailors' shops require ventilation through the roof.

The guard-rooms should also be ventilated by inlets. They have chimney ventilators at present. Remodelled grates should be introduced to save fuel.

There is a large riding school behind the cavalry barracks. It is deficient both in light and ventilation ; and after the men have been in it for some time the atmosphere becomes very offensive ; and many severe cases of colds, fevers, &c. have been traced to the foul condition of the air. Glass slabs in the roof would remedy the defective light, and three large louvred turrets should be placed in the ridge to act as outlets for the ventilation. An opening three feet square in each gable, protected by a flap, would afford the necessary area of inlet.

Close to the riding school is a large ash-pit and dung-heap, and an unusually extensive area was more or less covered with manure and filth. This was even the case close to the hospital, over the whole of which there was a strong smell of stable manure.

It ought to be made a point in all barracks where there are horses, to keep the surface scrupulously clean near the men's quarters, and especially in the vicinity of hospitals. Arrangements should always be made for removing the stable manure at short intervals, and to place the manure heap in such a situation that there should be no nuisance from it. As a whole, the surface cleansing of the back portions of these barracks requires more care being bestowed on it.

There are no day-rooms, cleaning-rooms, drill sheds, or married quarters either on the cavalry or artillery side.

*The requisite Sanitary Improvements are as follows :—*

1. Reduction of numbers in the barrack-rooms to the extent stated.

2. Two additional windows to be opened in each of the cavalry barrack-rooms over the stables.

3. Each of the barrack-rooms over the stables to have two shafts carried up from the middle line of the ceiling to above the roof, and four inlets for air, two on each side, with perforated zinc cornices.

Each of the other barrack-rooms in which there is a disused fireplace to have it bricked up and an opening into the chimney-flue to be made close to the ceiling, with an area double that of the chimney-flue. Each of these rooms to have two inlets with perforated zinc cornices, one inlet on each side the room.

The eight-men room to have a shaft carried from the ceiling to above the roof, and one inlet for air.

All the staircases to be ventilated by panes of perforated glass in the upper window sashes.

Each non-commissioned officer's room to be ventilated by a silk flap ventilator into the chimney-flue.

Each hut to be ventilated by a louvred turret in the ridge.

The library and reading-rooms to be ventilated by a shaft and inlet.

Guard-rooms to have additional ventilation by an inlet for air.

Remodelled grates for warming part of the admitted air to be introduced in the barrack-rooms and guard-rooms.

Riding school to be ventilated by louvres in the ridge and inlets in the gables, and to have additional light from the roof.

Stables to have shafts lined with zinc, to be carried from the ceiling to above the roof.

4. A ventilating funnel and tube to be provided for each gas-burner in the barrack-rooms.

5. An additional ablution-room to be provided. One of the present ablution-rooms to have more light through the roof.

6. Baths to be provided in the proportion of one bath to 100 men, and water to be laid on.

7. Women's wash-houses to be provided with fixed tubs and water laid on, gratings for the feet, additional light, and laundry and drying stoves.

8. Cook-houses to be provided with ventilated roasting ovens.

9. All the existing privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation. To be properly drained, and all the cesspits filled up and abolished. Urinals to be reconstructed with slate divisions, and water laid on, ash-pits to be abolished and carts substituted.

10. Surface cleaning of the barrack to be better attended to. Manure and other refuse to be more frequently removed. Manure heaps to be better placed.

Lastly. Married soldiers' quarters are much required in these barracks. At present married people are obliged to live in some wretched cottages outside the barrack gate, in a low damp situation on the banks of the canal, where high rents are paid for the worst description of accommodation, and much sickness arises in consequence.

*Portobello Barrack Hospitals.*

There are two hospitals under the same roof in these barracks; one for the cavalry side, the other for the royal artillery side. They are situated within a square enclosure at the southern angle of the barracks, close to the infirmary stables and dung-pit. The ward windows overlook the forage yard, the surface of which is always more or less covered with litter and decomposing matter; the smell from it and from the stables and dung-pit pervaded the whole building at the time we were there. The situation is therefore a very bad one for the sick, and every care should be taken to keep the adjacent ground clean, and the dung-pit should be removed, to diminish the evil as much as possible. The hospitals are exact counterparts of each other. They are each two stories high. They have each a central passage and staircase with short corridors, leading to the wards and offices.

On each ground floor there is a kitchen, surgery, serjeants' room, provision store, pack store, and orderly-room. On the upper floors there are four wards, two on either side of the staircase, and there is a water-closet with opposite seats out of each half-landing.

The end wards of each hospital have two windows to the open air on each side, but the small wards have two windows only on one side, and a door into the passage opposite the windows.

All the wards are very much overcrowded, as will be seen by the following table of accommodation:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| Cavalry: | | | |
| 1 | 7 | 4 | 3 |
| 2 | 11 | 6 | 5 |
| 3 | 11 | 6 | 5 |
| 4 | 7 | 4 | 3 |
| Artillery: | | | |
| 1 | 7 | 4 | 3 |
| 2 | 11 | 6 | 5 |
| 3 | 11 | 6 | 5 |
| 4 | 7 | 4 | 3 |
| Total - | 72 | 40 | 32 |

On account of the cubic space of each ward not admitting of division into units of 1,200 cubic feet, except in two cases, we have in the preceding table given less than that amount per bed. The maximum number of beds, therefore, which these hospitals ought to contain is 20 in each.

There is an Arnott's ventilator in each chimney, and perforated panes in the windows, to afford ventilation to the wards. The plan, however, does not answer, as the ventilators have to be kept constantly closed on account of smoke issuing from them, and they give rise to a flapping noise which disturbs the sick. We would propose to ventilate each ward by a separate shaft carried up from the ceiling to above the roof, and by two inlets for air, one on each side the larger ward, and one inlet for air in each of the smaller wards.

The stair and passage windows should have one pane of perforated glass in the top sash of each window, and all the wards which at present are without openings over the doors should be provided with them. This provision for thorough ventilation is especially required for the smaller wards on account of their having windows only on one side.

Each ward is lighted by a gas-burner, but the burners are not ventilated. They require a funnel and tube to convey the effluvia into the chimney.

All the fire-grates are of the old pattern, and ought to be remodelled to save heat.

There is no lavatory for the sick in either hospital, and the patients wash themselves either in basins in the wards or in an itch ward in the yard behind, which is used occasionally as a lavatory and a place for keeping a slipper bath. A proper bath and lavatory are much required, and could be easily provided by extending the building projecting out from the staircase, in which the water-closets are at present situated. One fixed bath, with hot and cold water laid on, and a proper hospital ablution table, with fixed basins, is required for each hospital.

There is a kitchen belonging to each hospital; it is under a sick ward, and is not ventilated. It requires a shaft a foot square carried up through the roof, and perforated panes in the windows. The means of cooking hospital diets are defective; and to remedy this each kitchen should have a new range, with an oven and hot plate.

The water supply is derived from the same source

which supplies the barrack. It is not in a satisfactory state as regards its means of distribution, and it should be raised by pumping to such a level as will admit of its being laid on at pressure wherever water is required.

There are defects in the hospital drainage similar to those described in the barrack drainage. There are very offensive privies in the yard behind the buildings, communicating with cesspits, a line of which extends along the outside of the boundary wall. These cesspits are offensive in warm weather, and when they are cleansed the effluvia are described as intolerable. Fever and other diseases have been traced to these noxious emanations. The whole of the cesspits ought to be abolished, and the drainage improved. Provision should also be made for the daily carting away of the hospital refuse. The privies behind the hospital should be converted into water latrines, with divisions of seats, half-doors, light, and ventilation.

*The following are the Sanitary Improvements required for these Hospitals:—*

1. Reduction in the number of beds to the extent specified.
2. Ventilation of the wards by shafts and inlets, as described, and by openings over the doors where there are none at present. Ventilation of the passages and stairs by panes of perforated glass in the windows.
3. A ventilating funnel and tube to be placed over each gas-burner in the wards.
4. The projections containing the water-closets to be extended to afford space for a bath and ablution-room for each hospital. One bath, with hot and cold water laid on, to be provided in each hospital, and also a proper ablution table. Water-closets and bath-rooms to be separated from the staircase by a ventilated lobby, with a window on each side.
5. Kitchens to be ventilated by shafts and perforated glass panes in the windows, and each kitchen to have a proper cooking range put up.
6. All cesspits to be abolished; the privies in the back yard to be reconstructed as water latrines, with division of seats, half-doors, light, and ventilation, and to be drained.
7. The dung-pit of the infirmary stables to be removed to a greater distance, and arrangements to be made for keeping the surface of the forage yard always clean.

## VI. RICHMOND BARRACKS.

Richmond barracks are situated at the outskirts, and to the south-west of Dublin, in a comparatively open situation, and having a few buildings in the neighbourhood. The ground was a swamp until a short time ago, but it has been drained. The troops quartered in the barracks in 1832–34 suffered much from the cholera of those years. The Grand Canal passes within 80 feet of the southern boundary wall, and somewhat above the level of the foundations. There is a cemetery between the canal and the barrack, which has been in use about 30 years. It is close to the married quarters, and may become noxious to the health of the barracks as the ground becomes more occupied, for the prevailing winds blow directly from the cemetery to the barracks. The barrack enclosure is an irregular parallelogram, 18A. 3R. 13P. in extent. The subsoil consists of argillaceous schist and aluminous earth. The permanent buildings are of stone, and have been erected at different periods since the year 1810. The whole have been recently repaired, but we have been informed that they require constant watchfulness on account of the perishable nature of the material of which they have been built.

There are two blocks of officers' quarters, and five blocks of soldiers' barracks; two of these blocks, with a passage between them, extend nearly the entire length of the ground, and the other blocks are built at right angles to the long central line of buildings. This central line, with the two end blocks, bound three sides of the parade ground, the fourth side of which is completed by the prison, hospital, stores, privies, and other offices. Close to the western wall are the chapel-school, and some iron huts used as barrack-rooms.

There are 10 staff serjeants' rooms, 30 serjeants' rooms, 80 soldiers' rooms, and seven huts. In 39 barrack-rooms there is a serjeant's berth in one corner. The barrack ranges are three stories high, and the rooms are in houses with a central staircase, having two barrack-rooms and a serjeant's room entering from it on each floor.

The soldiers' rooms are all 11 and 14-men rooms, and the total regulation accommodation, including the huts, is for 1,232 non-commissioned officers and men. But the regulation number was very much exceeded at the time the return was made to us, for the barracks then contained 1,539 men, with a space of little more than 300 cubic feet per man.

The following table gives the details of the barrack-rooms, exclusive of the huts :—

| Rooms. | Total Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Regulation Accommodation in Men. | Actual Inmates. | Excess of actual Inmates over Accommodation at 600 Cubic Feet per Man. | Number of Inmates each Room ought to contain. |
|---|---|---|---|---|---|---|
| 23 | 322 | 253 | 69 | 345 | 92 | 11 |
| 2 | 28 | 22 | 6 | 30 | 8 | 11 |
| 10 | 110 | 90 | 20 | 150 | 60 | 9 |
| 1 | 11 | 9 | 2 | 15 | 6 | 9 |
| 17 | 238 | 187 | 51 | 289 | 102 | 11 |
| 3 | 42 | 33 | 9 | 51 | 18 | 11 |
| 2 | 22 | 18 | 4 | 34 | 16 | 9 |
| 1 | 14 | 11 | 3 | 17 | 6 | 11 |
| 2 | 28 | 22 | 6 | 34 | 12 | 11 |
| 2 | 22 | 18 | 4 | 34 | 16 | 9 |
| 11 | 121 | 99 | 22 | 187 | 88 | 9 |
| 2 | 28 | 22 | 6 | 34 | 12 | 11 |
| 1 | 11 | 9 | 2 | 17 | 8 | 9 |
| 2 | 28 | 22 | 6 | 38 | 16 | 11 |
| 1 | 11 | 9 | 2 | 19 | 10 | 9 |
| Total | 1,036 | 824 | 212 | 1,294 | 470 | — |

The regulation number of men exceeds the accommodation, reckoned at somewhat less than 600 cubic feet per man, by from two to three men per room, while the actual inmates exceed the accommodation by from four to ten men per room.

The total excess of the regulation accommodation over what it ought to be at 600 cubic feet per man is 212 men, and the total excess of the present inmates over the accommodation at 600 cubic feet each is 470 men.

The last column in the preceding table shows the number of men each room ought to contain. In order to make the requisite reductions from the regulation numbers, it will be necessary to remove three men out of each 14-men room, and two men out of each 11-men room. This will give the remainder less than 600 cubic feet per man.

There are seven huts with regulation space for 18 men each, or 126 in all. We do not propose any reduction in this number, but the occupants per hut, when we saw them, had been raised from 18 to 25, and we should recommend that the excess be at once removed. Eighteen men is the maximum number any of these huts ought to contain.

All the barrack-rooms have some provision for ventilation; the rooms go through and through the ranges from front to back, and have windows on opposite sides, the total number varying from three to five per room. These windows have a pane of perforated glass in the upper row, two panes per room.

They have besides an Arnott's chimney ventilator in each room, intended to carry off the effluvia from the gas. These ventilators are found to be of no use, on account of the large size of the fire-place, while on the contrary, they admit smoke into the room ; besides perforated glass panes form very inefficient inlets. We consider it necessary therefore that these rooms should be properly ventilated by a shaft carried from the ceiling to above the roof, and by two inlets for air, one on each side of the room, with perforated zinc diffusing cornices. The chimney ventilators had better be closed until the grates are remodelled, after which they would further improve the ventilation.

Some of the rooms have a built-up fireplace. The easiest way to provide a shaft for these rooms would be to make an opening into the disused chimney-flue close to the ceiling, as appears to have been done in some instances; the opening should be double the area of the flue, and should be protected by a grating with large openings. In rooms where there is no spare flue a wooden shaft would be required.

The serjeants' mess and the reading-room should be similarly ventilated. The serjeants' quarters have chimney ventilators, but in order to their efficient action remodelled grates will be necessary. All the barrack staircases should be ventilated by perforated panes in the windows.

The huts are partially ventilated at present by louvres over the end doors, but they will require in addition to have a louvre in the ridge where the stove pipe passes through.

Gas has been introduced into all the barrack-rooms, but the only means of escape for the effluvia is by the chimney ventilators, which, as already mentioned, do not act. Each burner should have a proper ventilating funnel and tube, to convey the effluvia into the nearest chimney or ventilating shaft.

There are two good ablution houses, containing benches, basins, and 22 foot-pans. There are two baths recently put up ; the number, however, is by no means sufficient, and it will be necessary to provide one for every 100 men. One of the ablution houses is rather dark, and one of them requires gratings to stand on.

There is one women's wash-house, with boilers and gratings, no fixed tubs and no drying stove, but there is besides an excellent laundry attached to the new married quarters, fitted with boilers, fixed tubs, and hot and cold water laid on. There is a drying closet properly heated, containing 21 clothes' horses ; and there is also an ironing room fitted with tables, benches, mangle, and laundry stove ; the arrangements are very satisfactory. The whole is lighted with gas. Additional light to the laundry by means of skylights is desirable.

There are four cook-houses, containing 11 boilers in each ; each has a very good oven, capable of baking nine tins of meat. They require additional ventilation by louvres in the roof.

There are no day-rooms or cleaning-rooms.

There is one chapel school, and one soldiers' room has been misappropriated for an infant-school ; this room should be ventilated like the other barrack-rooms.

Another soldiers' room has been misappropriated as a library ; it also requires similar ventilation.

There are two verandahs, intended for drill sheds, erected in front of the soldiers' quarters. They are 300 feet in length, by 12 feet in width, and 9 feet 6 inches high.

These sheds cover the windows on one side of the lower barrack-rooms, and darken them. We would recommend that this defect be removed, by constructing all that part of the roof of the verandah over each window of glass.

There are six workshops belonging to the barrack, two armourers', two tailors', and two shoemakers'. The tailors' and shoemakers' shops are both dark and insufficiently ventilated. They should each have a skylight, and a shaft with two inlets for ventilation.

Water for Richmond barrack is obtained from the Grand Canal. It is brought in by a supply pipe, and filtered into a tank, from which it is conveyed for use to the different parts of the barrack. There are also four wells with pumps, but the water is not fit for drinking and cooking purposes. The drains are in all cases outside the buildings, and the sewage is discharged into a main sewer, five feet high by three feet wide, outside the boundary wall. This sewer discharges itself into a rivulet, which is sometimes dry, at a distance of 130 yards. Nothing is allowed to pass into this rivulet excepting fluids. It will be necessary to find a sufficient outlet for the improved barrack drainage, which it is indispensable in this instance to carry out.

All the privies are in a most offensive and noxious condition. They are of the usual defective construction, and open into cesspits. They should be entirely remodelled as water latrines, with divisions, half-doors, light, and ventilation, and the whole should be drained either directly to an outlet or into a cesspit, at a sufficient distance from the barrack boundary, with an overflow. When this improvement is effected, all the cesspits connected with the barracks should be abolished.

The provost establishment is situated close to the married quarters. It contains 22 cells, each of which has no more than 432 cubic feet of space, or about half what it ought to be.

There is no kitchen for cooking the prisoners' diets, and all the prison cooking has at present to be done in the provost serjeant's quarters, where there is but one small fireplace. A proper kitchen is required.

The privy behind the cells is in a very bad condition, and infects the air of the whole establishment. It requires reconstruction along with the others.

The refuse of this barrack is collected in ash-pits, one of which is situated close to the end of the hospital. These ash-pits are quite unnecessary, as it would be possible to collect and remove daily the whole refuse in iron carts. There are two guard-rooms, both of which should be ventilated by a shaft and inlet.

At one angle of the barrack enclosure married quarters have been recently erected for 80 families. They form two sides of a square, the other two sides of which are completed by the boundary wall. The buildings are three stories high. There are six passages and staircases, each of which gives access to four quarters on a floor. The rooms are rather small, and all are ventilated. Each room contains a cooking range, and all are lighted with gas. On the upper floors one of the quarters has a second room taken off the staircase. It would materially improve the ventilation of the whole establishment to ventilate each staircase by a shaft through the roof.

The privy in the square of these quarters is open to the objection already stated with regard to the barrack privies, and it should be drained and reconstructed as a water latrine in the manner already pointed out.

*The following are the Sanitary Improvements required for Richmond Barracks :—*

1. Reduction of the number of inmates in all the barrack-rooms to the extent stated, and reducing the inmates of each hut from 25 to 18, the regulation number.

2. All the barrack-rooms having a disused chimney to be ventilated by an opening into the flue double the area of the flue. The opening to be covered by a grating, and by two inlets for air with perforated zinc cornices ; one inlet on each side the barrack-room. Rooms that have no spare chimney-flue, to be ventilated by a wooden shaft, carried from the ceiling to above the roof, and by two inlets.

The serjeants' mess, reading-room, and infants' school to be similarly ventilated. The huts to be ventilated by a louvre in the ridge.

3. All the gas-burners to be ventilated.

4. Ablution houses to have gratings and additional light, and more baths to be provided.

5. Laundry to have additional light through the roof.

6. Cook-houses to be ventilated.

7. Tailors' and shoemakers' shops to have skylights, and to be ventilated by shafts through the roof, and two inlets.

8. Roof of the verandah where it passes over the barrack-room windows to be constructed of glass.

9. All the privies belonging to the barrack and married quarters to be drained and reconstructed as water latrines, with divisions, half-doors, light, and ventilation, and all the cesspits to be abolished. Urinals to be reconstructed and supplied with water.

10. A kitchen to be provided for the prison.

11. All ash-pits to be abolished, and the refuse to be collected and removed daily in iron carts.

*Richmond Barrack Hospitals.*

There are two hospitals under one roof for the accommodation of the sick in Richmond barracks. They form a long narrow building facing the parade ground about the middle of its length. The two houses are exactly alike, and have everything in duplicate. They are each entered by a central passage and staircase with the wards and offices opening right and left out of it.

On the lower floors are serjeants' rooms, pack stores, surgeries, and kitchens, and up stairs there are two floors of wards, with water-closets on the half landings.

The following table shows the present accommodation compared with what it would be at 1,200 cubic feet per bed.

| Wards. | Present Accommodation in Beds. | Accommodation at 1,200 Cubic Feet per Bed. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| No. 1 Hospital : | | | |
| First Floor - 2 | 18 | 10 | 8 |
| Second Floor 2 | 16 | 8 | 8 |
| No. 2 Hospital : | | | |
| First Floor - 2 | 18 | 10 | 8 |
| Second Floor 2 | 16 | 8 | 8 |
| Total - 8 | 68 | 36 | 32 |

The total accommodation at oss than 1,200 cubic feet per bed is only sufficient for 36 sick, that is provided the orderlies were removed out of the wards, for in No. 2 hospital an orderly sleeps in every ward, and thus four of the present number of beds in that hospital are not available for sick. In No. 1 hospital the orderlies sleep in a very small room, affording 405 cubic feet per man.

To diminish this overcrowding, the number of beds in the wards should be reduced as follows :—The beds in each of the first floor wards of the two hospitals, should be reduced from nine to five, and in each of the second floor wards from eight to four, and in both hospitals the orderlies should sleep away from the sick.

The wards are well lighted for their size, as they have each four windows, two back and front, but the windows in the upper wards are rather small.

For ventilation, there are in each ward two inlets and an Arnott's ventilator opening into the chimney. But this is not sufficient. There are two chimnies, one of which is built up, and we would propose to improve the ventilation by simply making an opening twice the area of the flue into the disused chimney, close to the ceiling. The opening should be covered with an open grating.

Besides improving the ventilation of the wards, we would advise that the stairs be ventilated by carrying a shaft from the top of each staircase to above the roof, and by perforated glass panes in the stair and passage windows.

The wards are lighted by gas, but the burners are not ventilated. A funnel and ventilating tube opening into the chimney should be provided for each burner.

There is no ablution-room for sick or convalescents. There is no bath-room. It has been proposed to convert the pack store into an ablution-room, but it would be much better to extend the projection in which the water-closets are placed, and to fit up a bath with hot and cold water laid on, and a proper hospital ablution table on the first floor of each hospital.

The kitchen arrangements appear to be sufficient, but as the kitchens are under hospital wards, they ought to be ventilated by shafts carried from the ceilings to above the roof, and by perforated panes in the windows.

The water supply is obtained from pumps and from the canal by filtration ; it is stated to be sufficient.

Each hospital has two water-closets, and there is a privy in the back yard drained into a cesspit with an overflow. These privies were in a most noxious state when we inspected the hospital ; they require drainage and reconstruction as water latrines, and the cesspits to be filled up. They also require additional light. There are no provision or bedding stores. The surgeries are much too small, and without suitable conveniences.

There is no accommodation for the sick of soldiers' families.

This hospital is, like so many other regimental hospitals, not well calculated for the treatment of sick ; it is very much too small for the strength, and there is no ground for extending it.

Either a new hospital should be built, or the present one should be retained merely for slight cases, and the sick beyond the number the building is capable of containing might be removed to the general hospital.

*The following are the Sanitary Improvements required for these Hospitals :—*

1. Reduction of the number of beds in each ward to the extent stated.

2. Improving the ward ventilation by an opening into the disused chimney, and by remodelling the ward grates. Ventilating the staircases and passages by shafts and perforated glass panes.

3. A ventilating funnel and tube to be placed over each gas-burner.

4. An ablution and bath room, with one bath, and hot and cold water laid on, to be provided for each hospital.

5. Kitchens to be ventilated by shafts from the ceilings, and by perforated glass panes in the windows.

6. Privies in the hospital yards to be reconstructed as water latrines, to be drained, and the cesspit abolished. Additional light to be given to these latrines through the roof. Hospital refuse to be removed daily.

7. Pack store to be provided with racks.

These improvements are urgently required for the present buildings, but after they are carried out they will leave the hospital accommodation totally insufficient for the strength in barracks.

## VII. BEGGAR'S BUSH BARRACK.

This barrack stands in an open locality to the south of Dublin. It is isolated from houses, and is about 500 yards from the Grand Canal. The site is flat and low, being not more than 24 feet above low water mark. Within the barrack enclosure there is an area of 8A. 1R. 30P., the subsoil of which is of stiff clay.

The barrack buildings are partly of stone, partly of brick. They were erected in 1830 and 1857, and in some important matters, bearing directly on the soldier's health, they show a considerable and gratifying advance and improvement over any other barracks we have visited.

The buildings occupy two squares, of which the first is formed by the entrance gate and wall, the officers' quarters, mess establishment, orderly-room, &c. The second square is behind, and is completed by the soldiers' quarters. The hospital, canteen, and offices are behind the second square.

Besides the permanent buildings, there are some corrugated iron huts occupied by men, and the total accommodation, including the huts, is for 802 non-commissioned officers and privates. There are in all 24 barrack-rooms, 12 huts, 15 serjeants' rooms, 8 staff-serjeants' quarters of two rooms each, and 10 pay-serjeants' quarters of two rooms each. There are besides 56 rooms for married soldiers, in special quarters built for the purpose.

The following table shows the accommodation in the soldiers' rooms :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 15 | 285 | 225 | 60 |
| 5 | 65 | 55 | 10 |
| 4 | 52 | 48 | 4 |
| 1 | 11 | 9 | 2 |
| Total 25 | 413 | 337 | 76 |

These rooms will not divide equally into spaces of 600 cubic feet, and we have calculated the accommodation per man at less than that amount ; but there is still an excess of 76 men over the number the rooms ought to contain.

In effecting the necessary reductions, the numbers per room in the first 15 rooms in the table should be reduced from 19 to 15 men per room. In the second group of five rooms the numbers will have to be reduced from 13 to 11 per room. In the group of four rooms from 13 to 12 per room, and two men will have to be removed out of the last room in the table.

The huts are made of corrugated iron lined with wood, but they are said to be cold in winter and hot in summer. They are open to the roof, and not ceiled with wood as other huts are, and this, to a certain extent, may account for the difference in warmth.

They have porches, three swing windows on each side, and louvres at the ends, but they are not sufficiently ventilated, and if they contained the whole regulation number of men they would be considerably overcrowded. It must be borne in mind that iron walls are more impervious to air than even brick walls. Consequently iron huts lose the advantages of the porous walls of ordinary wooden huts, but as huts they still retain the advantage arising from subdividing the men into small groups, instead of agglomerating them in masses under one roof.

Each of these iron huts has regulation accommodation for 25 men, with only 319 cubic feet per man. At the time the Return was made to us, the number of men in each hut had been wisely reduced from 25 to 18, and considering the impervious nature of the walls, we would propose that the number should never exceed 18, which will give about 443 cubic feet per man. The 12 huts accommodate by regulation 300 men. At 18 men per hut, they would hold 216 men.

All the non-commissioned officers' quarters have a comparatively liberal allowance of cubic space, though not reaching the amount laid down by us in our reports.

In the barrack-rooms of the central block an excellent system of ventilation has been provided in the construction by carrying up a separate shaft in the chimney stack from each room, and admitting air close to the ceiling and over the doors. The plan is essentially the same as the method of barrack ventilation, which we have recommended in our reports. The rooms in the centre are back to back, with windows only on one side. In the wings the rooms run through the building, and have windows on the opposite sides. These latter rooms have no ventilation, and will each require a shaft carried from the ceiling above the roof, and two inlets for air, with perforated zinc cornices, one inlet on each side of the room, close to the ceiling between the windows.

Further to facilitate the ventilation of the buildings, there should be panes of perforated glass introduced into the upper sashes of the windows of all the passages and staircases.

Additional ventilation should be provided in all the huts by two louvres in the roof, or by making one opening of sufficient area in the middle of the length of the hut, and carrying the stove pipe up through the middle of it, leaving a space all round for ventilation. The opening would have to be properly protected from rain outside.

In a number of the lower barrack-rooms the light is deficient on account of a verandah having been carried along the lower story of one face of the soldiers' range. This verandah is supported on cast-iron pillars, and is used as a drill-shed, for which it is well suited. It is 271 feet long, 12 feet wide, and 11 feet 6 inches high. A drill-shed is a most necessary and useful adjunct to a barrack, but there is no reason why it should be so constructed as to darken the rooms. Glass slabs in the roof over the windows would prevent this, and it should be made a point in all similar constructions in future, to make the roof of the shed where it passes over the windows of rough plate glass.

All the rooms are warmed by the old pattern grate. A remodelled grate to save fuel and to warm part of the admitted air ought to be introduced into each barrack-room.

The outside of the barracks is lighted with gas, but the soldiers' rooms by candles. We would recommend that gas be laid on throughout the barrack, and that each room have a ventilated gas-burner provided.

There is a very good arrangement of ablution-rooms in these barracks. Four of these rooms are built out from the back entrances to the main building, at right angles, and there is an open passage right across, between the door of the ablution-room, and the door of the barrack. Such an arrangement allows of the ablution-rooms being placed sufficiently near the dormitories, and while it enables the men to pass from the one to the other under cover, the cross ventilation prevents damp air passing into the staircases and barrack-rooms. It is by far the best plan we have seen.

The ablution-rooms themselves are very good. They have basins, benches, and water laid on, &c., but they would be improved by a few glass slates in the roof, to give additional light.

There is another ablution-room situated on the ground floor of the central range. It is a good room, but not so well adapted for its purpose as the others. Its position within, and not external to the building, is a defect.

Another very commendable improvement has been introduced into these barracks, namely, a bath-room. It has two slate baths, one hot, one cold. There is a boiler for heating the hot bath. The number of baths is too limited, and we would recommend that six additional cold baths be provided. There is an iron hut temporarily used as a school, in which they might be put up.

There is an excellent laundry, with washing troughs, hot and cold water, ironing and drying rooms, the latter with 24 clothes' horses, and there is besides a drying ground, with drying posts. The accommodation is good, and affords an example of what ought to be introduced into all barracks.

The barrack cooking is done in one cook house, with 16 boilers, and two ovens. Each oven is capable of roasting four tins of meat at a time. The ovens are set in brickwork, which is very apt to go out of order, and several of the bricks round the fire were loose at the time we were there. This is a defect inherent in ovens of this construction, and it is an important one, because, in addition to the cost of repairs, it occasions waste of fuel from the admission of more air than is wanted. It renders the fire difficult to manage, and makes the cooking uncertain. The only way to avoid these defects is to make all those parts on which the action of the fire depends of iron. The cook-houses require a louvre in the roof for ventilation.

The arrangements for water supply are good; water is derived from the city mains, and is laid on all over the barrack, both within and without. We can see no reason why the same thing might not be done in every case; it would tend to promote cleanliness and health among the men, while the amount of intoxicating liquors consumed by the soldiers would no doubt be diminished, if they had facilities for obtaining good drinking water at different points of the barrack enclosure.

All the buildings are drained with brick and glazed pipe drains.

The latrines are very good; they are constructed so that water stands in them, and they are flushed out periodically by a self-acting apparatus. There are divisions of seats, but there are no half-doors, and the buildings are too dark.

There is a large ash-pit beside them, which might very well be removed entirely, and the barrack refuse collected and taken away daily in iron carts.

A large iron hut is at present used as a school-room; it requires ventilation through the ridge, like that recommended for the other iron huts.

A new school-room has been provided for in the current estimates.

A children's school is required.

There are no day-rooms nor cleaning-sheds.

The canteen is a large and convenient building; at present it is used as a hospital, and the canteen is kept in a temporary iron building.

There is a tailors' shop at the back of the barrack, which requires ventilation by a shaft through the roof.

Ventilation by a shaft through the roof, and by an inlet at the ceiling, is required for the guard-room.

A new lock-up is wanted.

The provost establishment has 10 good cells, with a cubic capacity of from 812 to 966 feet each, well warmed and ventilated. The privy belonging to these cells is in the yard, and is connected with a cesspit. It should be drained and converted into a water latrine similar to the others, and the cesspit abolished.

There are excellent married quarters in these barracks; they are built in blocks three stories high, and each set of 12 rooms has a separate staircase and passage; each quarter has a small cooking-range, and the whole arrangement appears good and sufficient. The total accommodation, as already stated, is for 34 non-commissioned officers, and for 56 soldiers.

*The following Improvements are required for these Barracks:—*

1. Reduction of the regulation number of men in the barrack-rooms to the extent stated. Reduction of the regulation number of men in the huts from 25 to 18 men per hut.

2. All the barrack-rooms unprovided with shafts and inlets to have each a shaft carried from the ceiling of the room to above the roof, and two inlets for air with perforated zinc cornices, one on either side the room close to the ceiling between the windows. Guard-room to be ventilated by a shaft and inlet. Tailors' shop to be ventilated through the roof. Remodelled grates to be introduced into the barrack-rooms and guard-room.

Ventilation of each hut and of the temporary school hut, by enlarging the opening in the ridge through which the stove pipe passes, so as to leave an area of 12 square inches per man of outlet; the opening to be protected from rain by a louvred turret.

3. Additional light to be given to the lower barrack-rooms by inserting slabs of glass in the roof of the verandah over each window.

4. A ventilated gas-burner to be introduced into each barrack-room.

5. Ablution-rooms to have additional light by glass slates in the roof.

6. Six additional cold baths, with water laid on, to be provided.

7. Cook-house to be ventilated by a louvre through the roof.

8. Latrines if possible to have half-doors, and additional light through the roof.

9. The privy in the provost's establishment to be drained and converted into a water latrine. The cesspit to be abolished.

10. Ash-pits to be abolished and iron carts substituted for collecting and removing the refuse.

*Beggar's Bush Hospital.*

The hospital accommodation for this barrack is deficient, and it has been found necessary to extend it by placing sick in the canteen buildings. The hospital proper is built at one of the angles of the boundary wall, and consists of three stories. A wide hanging stone staircase passes up through the building, giving access right and left to the wards. There is a projection built out behind the staircase, which, on the ground floor, gives space for a lavatory, and on the two upper floors for water-closets. The staircase and passages are well lighted, and in the ceiling of the top story is a large iron grating, opening under the roof, intended to act as a ventilator for the staircase. This is not enough, and it is necessary to improve this ventilation, by carrying a louvred shaft from the ceiling of the staircase above the ridge of the roof, and by placing panes of perforated glass in all the stair and passage windows.

On the ground floor are situated the kitchen, surgery, serjeants' quarters, pack store, &c., and on each of the upper floors are two wards.

The kitchen is under one of the wards, and has no means of ventilation, and the heat in it is stated to be at times intolerable. To obviate this defect it will be necessary to carry a shaft from the ceiling, about a foot square, above the roof of the hospital, and to put perforated glass panes in the windows.

The cooking arrangements are good, but the kitchen range is stated to be rather small.

There are four water-closets, two on each floor, to which water is supplied by a force pump. They open on to the staircase, and have no independent means of ventilation. We would propose that a shaft, nine inches square, be carried from the ceiling of each closet to above the roof.

The sick-wards are of two sizes, and vary in height from 10 feet 8 inches to 11 feet 8 inches. They are overcrowded, as will be seen from the following table of the accommodation:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Accommodation in Beds. |
|---|---|---|---|
| First Floor, No. 1 | 5 | 3 | 2 |
| „ No. 2 | 10 | 6 | 4 |
| Second Floor, No. 1 | 5 | 3 | 2 |
| „ No. 2 | 10 | 6 | 4 |
| Total - | 30 | 18 | 12 |

At an average cubic space of somewhat less than 1,200 feet per bed, there is accommodation for 18 beds, and no more.

There is besides a small ward for itch patients, but it is occupied by orderlies, as itch wards are not now considered to be necessary on account of the introduction of improved methods of treatment.

Each ward is ventilated by shafts carried up in the chimney stalk, and by two inlets for air close to the ceiling, one on each side. There is also an opening for admitting air from the staircase over each door. The plan is a very good one, and is similar to the one we have advised for barracks and hospitals generally. It is doubtful, however, whether the outlet shafts have sufficient area to permit the required amount of air to pass, and it would be very desirable to give every facility to the ascending current by enlarging the opening from the ward into the shaft to double the area of the shaft.

The wards are warmed by the common pattern grate, instead of which we would recommend the introduction of a remodelled grate, to save heat.

Gas is much needed in this hospital in place of the present inefficient method of lighting the wards by candles. A ventilated gas burner with a funnel and a pipe leading into the chimney, ought to be introduced into each ward. The kitchen, surgery, staircase, and lobbies ought to be also lighted with gas.

As already mentioned, the ablution-room is situated on the ground floor behind the staircase. Its construction is more like that usually adopted for a barrack than for a hospital. It is cold and damp. The floor is flagged, and the ablution table is of the usual barrack form, with moveable basins and water taps. It is certainly an improvement to have provided this accommodation, defective as it is, but lavatories for hospitals ought to be in close proximity to the sick wards; they should have wooden floors, and fixed basins, with hot and cold water laid on, and the patients should be thoroughly protected from cold and damp in using them. Lavatories fulfilling these indispensable conditions exist in most civil hospitals, and in some military hospitals, and they ought to be introduced into all.

The bathing accommodation for the sick consists of a slate bath, with hot and cold water laid on, situated in one corner of the lavatory. The position of the bath is a bad one; were it possible to provide a proper ablution and bath room in one of the upper flats it would be better to remove both from their present position.

There is no wash-house; the patients' linen is washed at the general hospital, and is stated to be returned very indifferently got up.

Water for the hospital is obtained from the water company's works; it is stated to be good, but not quite sufficient in quantity.

Besides the water-closets within the building already mentioned, there is a privy over a cesspit in the back yard of the hospital. The cesspit should be abolished, and the privy reconstructed as a water latrine, with proper drainage.

There is also a urinal, but it is offensive from want of water for cleansing, and it is otherwise not properly constructed nor drained. An ash-pit in the yard ought to be done away with, and the refuse removed daily.

The offices of this hospital are very deficient. The surgery is too small; orderlies sleep in the wards from want of other accommodation. There is no foul linen and bedding store, and all the foul linen and bedding have to be kept in the pack store, which is also the only receptacle for clean linen and bedding,

As already stated, part of the hospital accommodation for Beggar's Bush barrack is in the canteen buildings, three rooms of which are temporarily occupied by sick.

The following table gives the details of this accommodation:—

| Wards. | Present Number Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| Ground Floor, No. 1 - | 5 | 3 | 2 |
| First Floor, No. 1 - | 5 | 3 | 2 |
| „ No. 3 - | 10 | 6 | 4 |
| Total - - | 20 | 12 | 8 |

In these rooms there is space for 12 beds instead of 20, giving an average of 1,200 cubic feet per bed.

It appears that the hospital accommodation required for the strength in these barracks is 50 beds, while the hospital proper has only space for 18 beds, and the canteen for 12, making 30 in all. It is evident, therefore, that this is one of those cases in which the question of providing additional hospital accommodation ought to be discussed, and it is worthy of consideration, whether it would not be advisable to extend the Phœnix Park general hospital to make it sufficient for the wants of the whole garrison, and to retain the present hospitals for casual cases or for convalescents. In the mean time the temporary wards in the canteen ought to be ventilated by Moore's louvred ventilators in the windows; and if they are to be used for sick for any length of time, we should advise a shaft and inlet to be provided for each room. Even if the sick were removed, the ventilating arrangements would be useful for the canteen.

*The Sanitary Improvements immediately required for Beggar's Bush Hospital are as follow:—*

1. Reducing the number of beds in the hospital and canteen to the extent stated.

2. Improving the ventilation of the hospital wards by enlarging the opening into the ventilating shafts, and providing for the ventilation of the canteen wards by glass louvres in the windows, or by shafts and inlets. Ventilating the hospital staircases by a shaft from the ceiling through the roof, and by perforated glass panes in all the stairs and lobby windows. Ventilating the water-closets by shafts from the ceiling through the roof. Ventilating the kitchen by a shaft and perforated glass panes. Remodelling the ward fire-grates.

3. A gas-burner to be introduced into each ward, and ventilated by a funnel and pipe into the chimney.

4. Privy in the yard to be reconstructed as a water latrine, with drainage, and the cesspit to be abolished. Urinal to be reconstructed and supplied with water. Ash-pit to be done away with, and the refuse removed daily.

## VIII. PIGEON HOUSE FORT.

Pigeon House Fort is situated at the extremity of a long narrow tongue of land, projecting into Dublin bay at the mouth of the Liffey. It is almost surrounded by water, and is fully exposed to the sea breezes.

From the nature of the ground, the fort is of a long narrow shape, and the buildings are somewhat crowded together, but notwithstanding this circumstance, the facilities for the external ventilation of the buildings are ample.

The total barrack accommodation is for 202 non-commissioned officers and men. The barrack-rooms are in several buildings, of different forms and construction. The larger rooms are from about 27 to 31 feet long, from 20 to 22 feet wide, and they vary in height from 8 to 12 feet. They have generally four windows each, two at either end, and the space per man varies from under 300 to a little above 400 cubic feet.

The rooms enter right and left from the passages and staircases. They are in two flats; but in one

building there are two large rooms in the basement, several feet below the level of the ground. In another building, near the West guard-house, the rooms have windows towards the interior of the fort, and loop-holes covered with iron doors towards the outside. The accommodation in each group of rooms is shown in the following table :—

| Rooms. | Present Regulation Accommodation in Men. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 4 | 64 | 48 | 16 |
| 2 | 34 | 16 | 18 |
| 2 | 30 | 22 | 8 |
| 1 | 15 | 11 | 4 |
| 1 | 5 | 4 | 1 |
| 3 | 18 | 15 | 3 |
| 3 | 18 | 12 | 6 |
| 1 | 15 | 8 | 7 |
| Total, 17 | 199 | 136 | 63 |

In these 17 barrack rooms there is a deficiency of space for 63 men on the present construction, and that at considerably less than 600 cubic feet per man. In proposing the amount of reduction in the preceding table, we have been guided by the exposed situation of the buildings, which renders ventilation more easy than it would otherwise be, and also by the construction of the rooms.

In one instance, however, we have given the men a small excess over 600 feet. It is the case of the two 17-men basement barrack-rooms, the second two in the table, which, although the least suitable for occupation, are the most overcrowded in the fort. These two rooms can hold eight men each without inconvenience, instead of 17, the present number.

The necessary reductions, therefore, stand as follow :—

In each of the first four rooms in the table, the inmates should be reduced from 16 to 12. In the next two rooms from 17 to 8. In the next three, from 15 to 11. One man should be removed out of the 5-men room. In the first group of three rooms, the numbers should be reduced from six to five per room. In the next group of three rooms, two men per room should be removed, and in the last room in the table there should be eight men, instead of 15.

The total accommodation is no more than sufficient for 136 men as a maximum number.

None of the barrack-rooms are ventilated. Each room requires a shaft to be carried from the ceiling to above the roof, and, taking the exposure of the buildings into account, one inlet with a valve and a perforated zinc cornice will probably be found sufficient for admitting air to each room. In the rooms near the West guard-room the loopholes might be made available as inlets by making small holes in the upper divisions of the iron shutters, and covering them with an inclined screen, to throw the admitted air towards the ceiling. As warming and ventilation ought always to be considered together for barrack rooms, it would be well to economize heat, and to provide for warming part of the air admitted during winter by remodelling the present grates so as to have a chamber behind them, through which air would pass before entering the room.

The method of ventilation by shafts and inlets has special reference to the larger class of barrack-rooms. There are seven small rooms, with five and six men in each, out of which we have proposed to remove in some cases one man, in others two men. These rooms would require an inlet, but not a foul air shaft. All the purposes of such a shaft would probably be answered sufficiently by placing a large sized silk flap ventilator into each chimney, and by remodelling the fire grate so as to contract the chimney opening below, an essential condition to the proper action of a chimney ventilator.

All the passages and staircases should have their ventilation improved by perforated glass panes in the upper window sashes.

There are three non-commissioned officers' quarters, each of which should have a silk flap ventilator into the chimney. There are serjeants' bunks in the barrack-rooms, which, in these as in other barracks, obstruct both light and ventilation. A serjeants' quarter has been partitioned off from the top of the staircase between the barrack-rooms near the West guard-house. It has no fireplace, and is unfit for its purpose.

There are two guard-rooms, with accommodation for six and twelve men. The smaller of the two, that for six men, gives only 285 cubic feet per man. The larger guard-room is also overcrowded. It gives 365 cubic feet for each of its 12 occupants. The overcrowding in guard-rooms is a difficult matter to deal with, and until larger rooms are provided we must trust to ventilation to keep them healthy. Neither of these rooms is ventilated. They should both he provided with remodelled grates for admitting warmed air in winter. The smaller room should have a silk flap ventilator into the chimney, and the large room should have a shaft carried through the roof.

Air is supplied to the lock-up through loopholes, but the ventilation is not sufficient. A double current roof ventilator on Mackinnel's, Watson's, or Muir's principle, ought to be provided for it, and the loopholes closed.

Over the guard-room is placed the library and reading-room. It is intended, we believe, to convert this room into a soldiers' quarter, but whether this step be taken or not, the room ought to be ventilated like the barrack-rooms by a shaft and inlet, and warmed by a remodelled grate.

There are two school-rooms, both of which should have silk flap ventilators into the chimnies, and inlets for air. The canteen tap-room also requires ventilation. The barrack is lighted by lamps externally, and by candles in the rooms. There is no gas nearer at present than the opposite extremity of the causeway. There is no doubt that it would be a great improvement to lay a main for lighting the barrack if the cost admitted of it.

These barracks, though covering a considerable length of ground, have only one ablution-room, at too great a distance from some of the men's rooms. It is deficient in light and ventilation. It has no gratings for the feet, nor pegs to hang clothes on ; and there is no bead to the table to prevent the water dashing over on the men while washing. The water taps are an excellent modification of the common tap. The handle is weighted, so that the weight must be held up all the time the water is running, and whenever the weight is allowed to fall the stream is cut off. It is a simple practical contrivance to save water, and one not more likely to be put out of order by misuse than is the common tap.

The floor of the ablution-room is well drained for carrying off the water rapidly.

This ablution-room should have glass slates and a louvre in the roof for ventilation, as well as gratings and pegs.

It might be well to consider whether another lavatory might not be constructed nearer some of the barrack rooms than is the present one.

There are no baths. Notwithstanding the proximity of the barracks to the sea, we still consider that two baths, with water laid on, are requisite for cleanliness. Sea bathing cannot always be resorted to, and sea water is not effective for cleansing the skin.

There is one women's wash-house provided, with three 25-gallon boilers, and benches for tubs, but it is deficient in other requisites for getting up linen. Fixed tubs, with water laid on, should be provided ;

also a drying and laundry stove. The building requires to be ventilated by a louvre in the roof.

One cook-house, with eight boilers, is used for cooking the rations. It has no other means of cooking, and should have a roasting oven put up. It is rather dark, and would be improved in this respect by having a few glass slates placed in the roof.

Water for the whole barrack is obtained solely from the roofs of the different buildings. It is conducted into four tanks, capable of containing 35,000 gallons, to which filters are attached; there are, besides, two fire tanks of 10,000 gallons capacity. The water is raised for use by pumps. The present supply is barely sufficient for ordinary purposes, and none of it is available for sanitary improvements. For water latrines, cleansing drains, &c., a sufficiently pure water could be obtained by sinking a well in the sandy subsoil; the water so obtained would probably be brackish, but it would answer the purposes intended. A tank and pumping apparatus, worked either by manual labour or by a small half-horse power windmill, of the construction recently introduced for such purposes, would be required to raise the water.

It might be well to consider whether in barracks like these, situated on the sea, and at a distance from a proper water supply, an apparatus might not be put up, in connexion with the cooking establishment, for distilling sea water.

The surface drainage of the fort takes place chiefly by percolation through the porous subsoil. There are short drains from the different offices leading directly to the sea; they are stated to be all trapped.

The most defective part of these barracks are the privies. There are nine of them altogether; six are placed along the sea wall, with the intention that the tide should wash away their contents. There are spikes in the pits to prevent the escape of soldiers from the barracks; these obstructions effectually retain the refuse, and as there is generally a strong current of air up the shafts, there is constant nuisance from them. Apart from these noxious gases, the structure of the buildings is not consistent with decency, and the whole require reconstruction.

Water latrines, on Macfarlane's principle, should be introduced, and there should be divisions of seats, half-doors, light, and ventilation in all the buildings. One privy opens into a cesspit; it should be reconstructed and drained like the others, and the cesspit abolished. The urinals are not in a good state; they also require reconstruction, with water laid on for cleansing.

There are no day-rooms, cleaning-rooms, drill-shed, nor married soldiers' quarters within the fort. There are usually seven women accommodated in the men's rooms. The only workshop is a tailor's shop. These various deficiencies cannot all be supplied at present; *but the following improvements, which are necessary for the health of the men, ought to be at once proceeded with:—*

1. Reduction of the regulation numbers in all the barrack-rooms to the extent stated.

2. Ventilation of each of the larger barrack-rooms by a shaft and one inlet for air; ventilation of each five and six-men room by a large sized silk flap ventilator into the chimney, and by an inlet for air; ventilation of the library and reading-room by a shaft and inlet; loopholes to be used for inlets in the manner pointed out; each non-commissioned officer's quarter to have a silk flap ventilator into the chimney; the staircases and passages leading to the men's rooms to be ventilated by perforated panes in the windows; the larger guard-room to be ventilated by a shaft through the roof, the smaller guard-room by a silk flap ventilator into the chimney; lock-up to be ventilated by a roof ventilator; school-room to have silk flap ventilators into the chimnies, and inlets for air; remodelled grates for saving fuel and heating part of the admitted air to be provided for the rooms; canteen tap to have a silk flap ventilator into the chimney.

3. Ablution-room to have additional light and ventilation through the roof, to be provided with gratings and pegs, and to have a bead put to the table.

4. Two baths, with water laid on, to be provided.

5. Women's wash-house to be provided with fixed tubs, and water laid on, a drying and laundry stove, and ventilation through the roof.

6. Cook-house to have a roasting oven put up in it, and additional light to be admitted through the roof.

7. Water supply to be increased as suggested.

8. Privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation; cesspit to be abolished; urinals to be reconstructed and supplied with water.

### *Hospital, Pigeon House Fort.*

The hospital is situated in the north-east angle of the works. It consists of a square building two stories high, with a projection in front in which is a lobby, water-closet, &c. The situation is perfectly airy and open, and overlooks the sea.

A wide stone staircase runs up the middle of the building, and gives access to a passage on the top flat out of which the wards enter. The hospital kitchen is on the same floor as the wards, and occupies space which would be much better adapted for sick. The serjeants' room and surgery are also on the upper floor. Altogether, there are three sick wards above and one itch ward on the ground floor. They are considerably overcrowded, as will be seen by the following table of accommodation:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Space. |
|---|---|---|---|
| No. 1 - - | 4 | 2 | 2 |
| „ 2 - - | 4 | 3 | 1 |
| „ 3 - - | 5 | 3 | 2 |
| Itch - - | 4 | 2 | 2 |
| Total - | 17 | 10 | 7 |

Including the itch ward, there is barely space for 10 beds. As itch is now treated in such a manner as to render special wards unnecessary, it has been proposed to obtain space for more sick by converting the present itch ward into a kitchen, and appropriating the present kitchen as an additional sick ward. This might be done with advantage, provided the kitchen, when so transferred, were ventilated by an air shaft, a foot square, carried from the ceiling to above the roof of the building, and by perforated panes in the windows. It would be well to consider, also, whether other rooms might not be similarly used for extending the ward accommodation, and whether suitable premises for the displaced offices might not be constructed out of the hospital. At any rate, the ward accommodation requires to be extended.

There are two small rooms for serjeants' quarters, but there are no rooms for orderlies or servants, and they are obliged to find sleeping accommodation in the serjeants' quarters or in the kitchen.

Neither passages nor wards are ventilated. To effect this necessary improvement we would recommend that a glass louvre be introduced into the upper sash of each stair and passage window; and as the wards will only hold two and three beds each, the required amount of ventilation would be obtained by a large size silk flap ventilator in the chimney, and by an inlet near the ceiling of the usual construction.

In carrying out this method of ventilation it will be necessary to remodel the ward grates, to warm part of the admitted air, and to contract the throat of the chimney in order to make the ventilator act.

The hospital has no lavatory or bath. One fixed bath is required, with hot and cold water laid on, and a proper hospital ablution table, with sunk basins and

water laid on. The space required for them might be obtained by extending the projection in front of the building.

The kitchen, as already stated, is next the wards on the top floor; it ought to be forthwith removed. It is not supplied with the necessary cooking and other kitchen arrangements, and is altogether very defective. When it is removed, the new kitchen should be supplied with a proper cooking-range and other requisites.

An additional supply of water is very much required for the hospital, as well as for the fort generally. Roof water is at present collected for use, but the amount is insufficient, and although a supply is laid on to the water-closet, the soil-pan is apt to get out of order, from the small and irregular quantity of water available for the closet.

The water supply requires to be improved and extended along with that of the fort.

There are no provision nor bedding stores. The pack store is in a small room, without any means for heating or keeping it dry.

There is no laundry or means of washing hospital linen.

In the back yard there is an offensive open privy over the sea. It should be converted into a water latrine. There is no urinal. One supplied with water is required beside the latrine.

*The following are the Sanitary Improvements required:—*

1. Reduction of numbers in the wards to the extent specified.
2. Ventilation of the staircase and passages by glass louvres in the windows. Ventilation of the wards by silk flap ventilators and inlets. Ward grates to be remodelled.
3. Kitchen to be removed from its present position and reconstructed with proper cooking arrangements and other conveniences, and to be ventilated by a shaft and perforated glass panes.
4. Water supply to be extended and improved.
5. A bath-room, with one bath and hot and cold water laid on, to be provided, and an ablution table to be put up in it.
6. Privy in the yard to be reconstructed as a water latrine, and an urinal supplied with water to be attached to it.

Lastly. The deficiencies in ward space and in offices should be supplied by new buildings.

## IX. ALDBOROUGH HOUSE BARRACK.

This building was formerly a private mansion, and is held on lease from Colonel Stratford from year to year, surrenderable on three months' notice or three months' rent, at 250*l.* per annum. It was at one time proposed to purchase it, with the land which surrounds the house, at a cost of 8,170*l.*, but the title was not considered good.

The building consists of a centre and two curved wings in the form of quadrants. It stands back from the road or street in a court-yard. One of the quadrants is formed by a large room, which was used as a theatre, and behind the other is the hospital and yard.

In the rear of the centre is a ten-sided building, which contains rooms occupied by serjeants, and behind is a large field or enclosure, in which is a double ball court.

The construction of the house is that of an ordinary large dwelling house, with the rooms opening out of a central hall and staircase. They are in three stories and a basement.

The rooms on the two lower floors are occupied by soldiers, and the basement contains kitchens and a wash-house. The upper floor is used for offices, &c.

The hall is lighted by a sky-light, which also affords a means of ventilation.

The building is at present used for recruits and also for invalids coming from out-stations to pass the board.

The following table shows the accommodation:—

| Rooms. | Total present Regulation Accommodation in Men. | Accommodation at 600 Cubic Feet per Man. | Additional Numbers of Men the Rooms would accommodate. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|
| No. 1 - - - | 57 | 61 | 4 | — |
| Inside Room - - | 8 | 5 | — | 3 |
| No. 2, Small Room - | 4 | 9 | 5 | — |
| „ 2, Large Room - | 32 | 20 | — | 12 |
| „ 3 - - | 23 | 20 | — | 3 |
| „ 4 - - | 14 | 16 | 2 | — |
| „ 5 - - | 12 | 11 | — | 1 |
| „ 6, Small Room - | 12 | 12 | — | — |
| „ 6, Large Room - | 31 | 31 | — | — |
| „ 8 - - | 42 | 33 | — | 9 |
| „ Ten Rooms in Roundhouse - | 40 | 40 | — | — |
| Total - | 275 | 258 | 11 | 28 |

There is little actual deficiency of accommodation, for in some rooms there are fewer men than they would contain at 600 cubic feet each. All that is wanted is to re-arrange the accommodation, so as to give 600 cubic feet per man. If this were done, Aldborough House would hold very nearly the regulation number of men. Another very important reason for re-arrangement, arises out of the present method of accommodating married people. Families are huddled together in rooms along with the recruits in a manner inconsistent with ordinary decency, and the men are kept out of their rooms during the day on account of this practice, while the coal issued for their use is misappropriated. We would strongly recommend that the married quarters should be at once removed out of the recruits' sleeping rooms.

The barrack-rooms have no special means of ventilation, and under the present arrangements of tenure it would perhaps be impossible to execute the necessary works. The least that could be done would be to place Arnott's ventilators in the chimnies and perforated panes in the top panes of each sash in all the rooms.

The kitchens are in the basement; they have boilers but no ovens. They are not used because recruits do not mess together, but receive their daily pay and procure their meals as they can.

The canteen man supplies them with what they require, his charges being, for a bowl of coffee 1½*d.*, a loaf of bread 2*d.*, a dinner of meat, vegetables, and bread, 4½*d.*

The room appropriated to the canteen is fitted up with seats and forms for a school, and appears to be the only room which the men have to sit in.

There is no ablution-room, and no bath, although accommodation of this kind is peculiarly required at every recruiting station. We would advise a proper ablution-room to be constructed in the basement, with a large plunge bath, similar to the one at the Westminster recruiting office.

The women's wash-house, which is a room in the basement, is not used. It has no drying or laundry stove.

The privies are an open trough, with a rail along the front edge, over a soil-pit, which is emptied by contract. They are in a very noxious state, and require reconstruction as water latrines, with proper divisions of seats, half-doors, light, and ventilation. The urinal should be supplied with water.

There is a large ash-pit close to the barrack-rooms. It should be abolished, and an iron cart provided, to be removed daily.

The guard-room, lock-up room, and cells require ventilation by shafts and inlets for air.

The ten-sided building in rear, already mentioned, contains small rooms, used as quarters for married men, round a central room, in the middle of which are

two open fireplaces, where all the cooking is performed. There are no ovens.

The rooms have a means of ventilation which is connected with an arrangement for warming air to be admitted from the floor, an opening for its escape being also placed near the roof. When we were there the warming apparatus was out of order, and the openings were pasted up.

Although the occupants of this establishment belong to the most irregular part of the army, and are men either ignorant of discipline or virtually emancipated from it, we see no reason why a better system should not obtain, both here and in other similar places, by considering such depôts as more or less permanently necessary, and dealing with them as such. Were this done, more cleanliness would be observed, and the buildings would be kept in a state more conducive to health than they are at present.

As regards food, the men appear to be very much at the mercy of the canteen keeper, both as to quality and price. There are no doubt difficulties in obtaining the regularity of meals observed in barracks. Fluctuation in number; irregularity in hours of arrival and departure; the unsettled, unformed habits of the men; the difficulty of collecting stoppages for constantly recurring broken periods, and of making approximate provision for daily varying numbers; all these are certainly obstacles to regular messing. We consider, however, that with management, wholesome meals, at stated times, might be provided at a fixed stoppage, under proper superintendence by a responsible officer, instead of the food being supplied, as now, by one who has only his own interest to consider.

For the reasons stated, we would not advise much money to be spent in this building, but *the following improvements are indispensable for the present use to which it is devoted*:—

1. Ventilation of all the rooms by silk flap ventilators and perforated panes in the windows. Guard-room, lock-up, and cells to be ventilated.

2. Re-arranging the accommodation to give 600 cubic feet to each bed, and removing the married quarters out of the soldiers' rooms into rooms by themselves.

3. Providing an ablution-room and plunge bath for the recruits.

4. Reconstructing the privies as water latrines, with divisions of seats, half-doors, light, and ventilation, and supplying the urinals with water. The ash-pit to be abolished, and the refuse removed daily.

*The Hospital.*

There are a few wretched rooms in an outbuilding, in which sick have been received. They have at present ceased to be used, and we would advise that no sick men be ever placed in them in future. They are utterly unfit for any such purpose.

## X. LINEN HALL BARRACK.

This building, as its name implies, was originally a place of business and storage for persons engaged in the linen trade, and never was, in any sense, intended for habitation. It was appropriated as a temporary reserve barrack in 1848, a gratuity of 100*l*., but no annual rent, being paid for its use.

It is situated in one of the densest, filthiest parts of Dublin. The buildings are three stories high and are arranged round a long parallelogram, with a half square in which the guard-room is situated, facing the entrance. Part of the buildings are supported on arches, forming a covered ambulatory, and the upper stories are reached by outside stairs of stone and by large inside stairs of wood. There are 128 rooms of one kind or another in the buildings, and their general arrangement is that of long corridors, some light, some dark, out of which a series of small cells open on one or both sides. Some of the rooms are of a different construction, and have windows on both sides, but the barrack consists essentially of cells and corridors. The rooms are of almost all degrees of darkness, and very few of them are light. There are only five fireplaces in the whole of this large structure; and when we were there the rooms were chiefly warmed by stoves in the passages, some of them out of repair, and pouring out volumes of smoke. About 120 rooms have no stoves and no means of warmth except what they may derive from the stoves in adjoining passages.

Both cells and corridors are appropriated as barrack-rooms, and all of them are greatly overcrowded. The cubic space varies from 176 feet to 430 feet per man.

In one room the cubic space is 176 feet per man.

In other 24 rooms the cubic space is under 220 feet per man.

In other 55 rooms the average cubic space is considerably under 300 feet per man.

In other 45 rooms the average space does not exceed 350 cubic feet per man.

And in 25 rooms the average space is 430 cubic feet per man.

The whole building is supposed to have regulation accommodation for 1,203 non-commissioned officers and men. The details of which, as regards the men's rooms, are given in the following table:—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A Square:— | | | |
| No. 1 | 26 | 10 | 16 |
| „ 4 | 9 | 4 | 5 |
| „ 5 | 30 | 13 | 17 |
| „ 6 | 4 | 1 | 3 |
| „ 7 | 12 | 5 | 7 |
| „ 8 | 17 | 6 | 11 |
| Nos. 9, 10, 12, 13, 14, 15 | 18 | 6 | 12 |
| No. 11 | 4 | 1 | 3 |
| D House | 45 | 13 | 32 |
| B Passage, No. 2 | 36 | 20 | 16 |
| B Square:— | | | |
| Nos. 22, 23, 24 | 21 | 15 | 6 |
| „ 25, 26, 27, 28, 29 | 40 | 20 | 20 |
| No. 70 | 15 | 5 | 10 |
| Nos. 71, 72, 73, 74, 75, 76, 77, 78 | 64 | 32 | 32 |
| Passage, No. 5 | 36 | 15 | 21 |
| Nos. 47, 48, 49 | 12 | 6 | 6 |
| „ 51, 69 | 14 | 8 | 6 |
| „ 50, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68 | 108 | 72 | 36 |
| „ 79, 80, 81 | 15 | 9 | 6 |
| „ 82, 84 | 12 | 6 | 6 |
| „ 83, 86 | 14 | 8 | 6 |
| „ 85, 87 | 16 | 12 | 4 |
| „ 88, 89, 90 | 9 | 3 | 6 |
| No. 91 | 5 | 3 | 2 |
| Nos. 92, 93, 94, 95, 96, 97 | 24 | 12 | 12 |
| „ 98, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 112, 113, 115, 116, 117, 119, 120, 122, 126, 127 | 88 | 22 | 66 |
| „ 114, 118, 121, 124, 125 | 10 | 5 | 5 |
| „ 99, 111, 123, 128 | 12 | 4 | 8 |
| Passage, No. 3 | 40 | 17 | 23 |
| No. 30 | 10 | 6 | 4 |

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44 - | 56 | 28 | 28 |
| No. 45 - - | 3 | 1 | 2 |
| „ 46 - - | 2 | 1 | 1 |
| E House :— | | | |
| No. 5 - - | 12 | 5 | 7 |
| „ 7 - - | 9 | 4 | 5 |
| Nos. 6, 8, 9 - - | 12 | 3 | 9 |
| No. 10 - - | 2 | 1 | 1 |
| „ 3 - - | 17 | 8 | 9 |
| „ 4 - - | 14 | 6 | 8 |
| „ 1 - - | 16 | 9 | 7 |
| „ 2 - - | 30 | 17 | 13 |
| Nos. 3, 4, 5, 6, 7, 8, 9, 13, 14, 15, 16, 17, 18, 19 | 56 | 28 | 28 |
| „ 10, 20 - - | 52 | 34 | 18 |
| No. 11 - - | 16 | 9 | 7 |
| „ 12 - - | 31 | 18 | 13 |
| Total - - | 1,094 | 531 | 563 |

The rooms generally are overcrowded to a greater degree than we have found them in any other barrack, although the means of ventilation are much more defective than we have seen them elsewhere.

If all the rooms and corridors were ventilated, lighted by additional windows and skylights, and properly warmed, the place would accommodate temporarily 531 men, or less than half the number on the present construction.

There are few, if any, public buildings in this country so ill adapted, as a whole, for human habitation as the Linen Hall, and there are certainly none in which the cubic space, light, and ventilation are more deficient. It is true that the place is intended merely for the temporary accommodation of troops, but even for this it is unfit in its present state ; and it cannot be otherwise than matter of surprise that out of an enemy's country such a place was ever thought of for such a purpose.

The small rooms have only one window.

There are no means of ventilation in any part of the building.

There is gas in the school-rooms, but none in the barrack-rooms, which are lighted with candles ; these school-rooms, of which there are two, are unventilated.

There are five ablution-rooms, but no baths.

The ablution tables are of wood. The ablution-rooms in the basement of the back range of buildings are dark, their walls and floors saturated with wet, and they have no gratings nor pegs.

The women's wash-houses have a boiler each, but no other laundry requisites.

There are two cook-houses, one of which has 21 boilers, the other six boilers. They have no ovens, and are too dark.

Water is derived from the city mains and from pump wells.

None of the privies are drained. They are all placed over open cesspits, and were in a most noxious condition.

Without going into minute details as to the defects of this building, we have merely indicated those more obvious ones bearing on its sanitary condition, and which exist now, although the building has been occupied for ten years.

To render it at all fit for a barrack, even for temporary purposes, would require a very large outlay of money, even were the building in an otherwise sound state. Much of it is in very bad repair, and, like similar buildings, if thorough repairs are commenced, there is no saying what the expense would be.

On every account, therefore, we would advise this building to be given up.

If it is to be retained, however, it must be repaired, ventilated throughout, and windows or skylights opened into dark rooms and passages, wherever practicable. All the rooms which do not open into the long passages and corridors should be ventilated by a shaft and inlet. All the corridors and passages should be thoroughly ventilated by large shafts and numerous perforated glass panes in the windows, or by large louvres through the roof. All the rooms opening into these passages or corridors require an inlet for air in the outer wall, and a large louvred opening over the door into the passage or corridor. The staircases should also be thoroughly ventilated by louvred shafts through the roof, and by perforated glass panes.

More light should be admitted into the cook-houses, and ovens for roasting and baking put up.

The lavatories should be improved, and baths should be put up.

The privies should be drained and reconstructed as water latrines, and the cesspits filled up. Suitable wash-houses should also be constructed.

These points, with a thorough cleansing and lime-washing of the whole building, constitute the smallest amount of improvement which this building should undergo ; and when they are carried out, the regulation number of inmates in the soldiers' rooms should not on any account exceed 531 men.

### *Linen Hall Hospital.*

The hospital consists of several miserable rooms taken off from one end of the Linen Hall. There are four wards, with regulation accommodation for 56 sick. Ward No. 1. has 16 beds, with 314 cubic feet per bed ; Ward No. 2. has 12 beds, with 297 cubic feet per bed ; No. 3. contains 16 beds, with 325 cubic feet per bed ; and on the second floor there is a place with 12 beds, at 506 cubic feet per bed.

The rooms are dark ; they have no fireplaces, and no ventilation.

It has never happened in our experience to find similar accommodation set apart for sick. We can only condemn it, and recommend that no sick man be ever placed in any of these rooms.

## XI. GENERAL MILITARY HOSPITAL, PHŒNIX PARK.

This large hospital stands on high ground close to the park, in a healthy isolated position, 383 yards distant from the river Liffey, within a long irregularly shaped enclosure, having an area of 8A. 2R. 6P. The subsoil consists of yellow clay resting on limestone rock.

The buildings are of stone, and were erected about the year 1787. They consist of a long centre running nearly from N.W. to S.E., and of two projecting wings, one at each end. Behind the main buildings, and close to the boundary wall, is a separate fever hospital, connected with which there is accommodation for a few maniacal cases.

At a short distance south of the hospital, in a hollow, there is a line of old two-story buildings, now used as a laundry, where the linen of the different military hospitals in Dublin is washed and got up.

In the centre of the main buildings composing the hospital are situated officers' quarters, the chapel, orderlies' rooms, and a corridor for keeping up the communication between the wings, in which all the wards are situated.

The hospital is in two divisions, medical and surgical, one division being situated in each wing. There are six wards in the medical side, and the same number in the surgical side ; they are of two sizes ; the larger are 49 feet long, and the smaller 22 feet long. All of them are 22 feet broad. Four wards in each

wing are 13 feet high, and two wards in each wing are 12 feet 6 inches high.

As a whole the wards are of tolerably good dimensions, and are very much better than those of many military hospitals erected since the date of this hospital. All the larger wards have seven windows each, placed in the opposite walls.

Some of the small wards have four windows, and some have three windows, similarly placed. A great fault in all these windows is, that they are very short in proportion to the height of the wards. They are, in fact, placed at the upper part of the side walls, and it is impossible for the sick to see out of the windows. The wards have all the appearance of being badly lighted, and they look gloomy. Nothing would improve them more than lowering all the window sills to three feet above the floor, were it practicable to do so.

With the exception of the Cupola ward, all the others are overcrowded with sick. The minimum cubic space is only 672 feet per bed, and the maximum space is 737 feet.

The following table gives the details of the accommodation :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| Medical Wing :— | | | |
| No. 1 - - | 19 | 12 | 7 |
| „ 2 - - | 9 | 6 | 3 |
| „ 3 - - | 9 | 6 | 3 |
| „ 4 - - | 19 | 12 | 7 |
| „ 5 - - | 9 | 5 | 4 |
| „ 6 - - | 19 | 11 | 8 |
| Surgical Wing :— | | | |
| No. 1 - - | 9 | 6 | 3 |
| „ 2 - - | 19 | 12 | 7 |
| „ 3 - - | 19 | 12 | 7 |
| „ 4 - - | 9 | 6 | 3 |
| „ 5 - - | 19 | 11 | 8 |
| „ 6 - - | 9 | 5 | 4 |
| Cupola - - | 15 | 15 | – |
| Fever Hospital :— | | | |
| No. 2 - - | 8 | 5 | 3 |
| „ 3 - - | 8 | 5 | 3 |
| Total - | 199 | 129 | 70 |

Allowing an average space of less than 1,200 cubic feet per bed, this hospital can hold 129 beds.

None of the wards have any means of ventilation except the doors, windows, and fireplaces. We would recommend that a shaft should be carried from the ceiling of each ward to above the roof, and that two inlets for air be introduced in the opposite sides of the wards close to the ceiling. These inlets should be of suitable dimensions to supply the quantity of air required, and they should each be provided with a perforated zinc cornice for diffusing the air.

Each staircase should also be ventilated by a shaft carried from the top ceiling to above the roof, and by perforated glass panes in the stair and passage windows.

The fever wards are 24 feet long by 22 feet wide. Two of them are 13 feet high, and one is only 10 feet high. They also require ventilation by a shaft, and two inlets for each ward.

There are rooms for the steward, storekeeper, ward-master, assistant ward-master ; and there are seven orderlies' rooms, and one room for out-orderlies.

All these rooms should have silk flap ventilators in the chimnies.

All the wards are warmed by the old fashioned grate. It would be well to replace this by a remodelled grate, to warm part of the admitted air.

Gas is used for lighting the exterior of the hospital, but only candles are allowed in the wards. We would recommend a ventilated gas-burner to be introduced into every ward.

There are two lavatories for the sick, and sinks on the landings in each wing of the hospital, and each wing has three water-closets. There is no proper bathing accommodation. The bath-room is in the basement of the surgical side. It has two baths placed side by side in a dark cold closet, quite unfit in its present state for sick persons to resort to.

It is proposed to build a scullery in the basement, out from the kitchen. Were this projection carried up, and a similar one built for the opposite wing, space might be obtained for a bath for each flat of the hospital.

The kitchen is in the basement, on the surgical side. It has a plain grate and boiler, but no oven. One should be provided.

Water for the hospital is derived from a pond in the Phœnix Park, but the supply is not to be depended on during summer, when water is most required. Storeage is provided for this water by large underground tanks behind the hospital ; the roof water is also received into these tanks. There are also three wells. The supply from all these sources is defective, and ought to be improved.

The hospital is drained, and all the water-closets are connected with the drains ; but there are a number of privies close to the course of the drains which are connected with cesspits. These should be abolished, and water latrines substituted ; but before this can be done the water supply ought to be improved.

The laundry already mentioned has a drying closet, but it acts imperfectly on account of the want of ventilation. It requires a large shaft through the roof to carry off the vapour from the clothes while drying.

This hospital admits of material improvement in its sanitary condition, while its site is such as to admit of sufficient extension for any general hospital purposes required at the station. We have already pointed out the great deficiency of hospital accommodation existing at the different barracks, and by far the best way of providing for this would be by extending the general hospital to render it capable of receiving the cases for which there is not sufficient cubic space in the different regimental hospitals. When so extended, Phœnix Park hospital should be organized and administered strictly as a general hospital for the reception of the more important cases of disease occurring in the different barracks. The less serious cases could be treated in the existing regimental hospitals, and by a little arrangement of duties, medical officers at this important station might have the opportunity of familiarizing themselves with the duties incidental both to regimental and general hospitals.

*The Sanitary Improvements required for the Phœnix Park Hospital are as follows :—*

1. Reduction of the number of beds to the extent stated above.
2. Ventilation of all the wards by shafts and inlets, and of the stairs and passages by shafts from the ceilings of the staircases, and perforated glass panes in the windows. Orderlies' rooms to be ventilated by silk flap ventilators in the chimnies.
3. Lowering the sills of the ward windows to within three feet of the floor, which is most important.
4. Remodelling the ward gates.
5. A ventilated gas-burner to be introduced into each ward.
6. Better bath accommodation to be provided.
7. A roasting oven to be put up in the kitchen.
8. Water supply to be increased in amount.
9. Cesspits to be abolished, and the privies reconstructed as water latrines.
10. Drying closet at the laundry to be ventilated by a shaft through the roof.

## XII. ARBOUR HILL REGIMENTAL HOSPITALS.

These hospitals are intended to receive the sick of the Royal, Arbour Hill, and Island Bridge barracks. They are situated on Arbour Hill, considerably above the Royal barracks, in an open, airy, healthy position.

The hospitals are eight in number, and are contained in two blocks of building, each three stories high. They are all as nearly as possible fac-similes of each other ; and from the excessive subdivision of the sick among so many establishments, all supposed to be complete in themselves, there has resulted this consequence, that not one, nor indeed all of the hospitals put together, contain the requisites or conveniences for the proper care and treatment of the sick. The hospitals vary somewhat in a few details, but they are all defective, and have involved in their construction a cost not at all commensurate with the results.

The eight hospitals have each a wide gloomy staircase up the middle of it, occupying a large part of its entire superficial area. Out of the staircase and passage on the ground floor there open in each hospital a kitchen, a surgery, and a serjeants' room, and in each of the two upper floors are two wards and one small room between them, formerly a ward, but now used as a nurses' room. On the upper two half-landings is a projection, which contains dark water-closets ; on the ground floor this projection contains the provision store. There are thus provided for the medical treatment of 208 sick, eight surgeries, eight provision stores, eight kitchens, eight hospital-sergeants' rooms, eight large staircases, eight pack stores, 16 water-closets, and the same number of privies. There is a waste of space in the buildings such as would, if properly used, have given ample accommodation for all the sick, and every convenience for their treatment, had the administration been consolidated in the first instance.

The wards in all the hospitals are of the same dimensions. They are 21 feet 9 inches long, 16 feet 7 inches broad, and 10 feet 10 inches high ; and they have regulation accommodation for six beds each. The small ward is used in some of the hospitals for one or two sick.

The following table shows the accommodation for the whole establishment :—

| Wards in the Eight Hospitals. | Total present Regulation Accommodation. | Total Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed spaces. |
|---|---|---|---|
| Larger, 32 - | 192 | 96 | 96 |
| Smaller, 8 - | 16 | 8 | 8 |
| 40 | 208 | 104 | 104 |

The cubic space for the sick is one half of what it ought to be, and there is accommodation, at 1,200 cubic feet per bed, for 104 beds, or 13 beds per hospital. That is for three beds in each of the larger wards, and for one bed in each of the smaller wards.

None of the wards are ventilated except by a silk flap ventilator, which is of little use.

In these buildings a separate shaft and inlet should be provided for each of the larger wards.

The staircase ought also to be ventilated and lighted through the roof.

All the ward grates are of a defective form, and waste most of the heat. They might be remodelled with advantage.

All the wards have gas-burners, but none of them are ventilated, and they require a funnel and tube for the purpose.

There are neither lavatories nor baths for the sick. Space could easily be found for placing these essential conveniences of hospitals.

The water supply is very deficient ; so much so, that in most of the hospitals the water-closets cannot be used in dry weather.

Behind the hospitals are narrow back yards, a few feet in breadth, which contain a number of privies placed over cesspits. These should all be reconstructed as water latrines, and the cesspits filled up.

The hospital stores are very deficient, and some of the pack stores are so damp that the things put into them become mouldy.

The kitchens generally are supplied with sufficient means of cooking.

*The Sanitary Improvements required for these Hospitals are as follows :—*

1. Reduction of the number of beds in all the wards to one half.
2. Ventilation of the wards by shafts and inlets. Ventilation and lighting of the stairs through the roof.
3. Gas-burners to be ventilated.
4. A bath and ablution room to be provided for each hospital.
5. Water supply to be extended and improved.
6. Privies behind the hospitals to be drained and converted into water latrines, and the cesspits to be abolished.

These recommendations, if carried out, would remove the more obvious sanitary defects in the buildings ; but after all there would not be a single good ward in the whole establishment. The deficiency of accommodation arising from giving 1,200 cubic feet per bed could be best made up by extending the Phœnix Park general hospital, and all serious cases might be sent there for treatment.

This would enable the existing regimental hospitals at Arbour Hill to be used for slighter cases. But if it be considered more advisable to retain the regimental hospitals in their integrity, we should recommend new hospitals to be built, rather than that the present defective buildings should be extended; and the present hospitals might be converted into married quarters, for which they would not be so unsuitable as they are for sick.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, March* 23, 1859.

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# DUBLIN DISTRICT. (Further Report.)

SIR,

IN conformity with our instructions we have examined into the sanitary condition of the following barracks in the Dublin district, and have now the honour to report the results, with our recommendations as to the improvements required.

The barracks we have inspected are :—

Longford, cavalry.
„ artillery.
Mullingar, infantry.
Galway Castle, cavalry and infantry.
„ Shamble, infantry.
Athlone, artillery.
„ cavalry.
„ infantry.

## I. LONGFORD BARRACKS.

There are two barracks and one hospital at Longford. One of these is a cavalry barrack situated at the outskirts of the town, with a hospital within the same enclosure ; the other is an artillery barrack situated at about a mile distant in the country.

### I. THE CAVALRY BARRACK.

This barrack adjoins the buildings at one end of the town of Longford, at about 100 yards from the

river Camlin. The situation is rather low, although there is a sufficient fall to the river to afford the means of drainage. There is an area of about six acres within the barrack enclosure, and the surface soil rests on limestone rock. The barrack buildings are towards one end of the enclosure, and are of various construction and date. At a short distance to the left hand of the entrance gate is a range of comparatively recent stone buildings, the centre of which is occupied by officers' quarters, and the wings by men's barrack-rooms. This range forms one side of the parade ground. Opposite to it is a large block of building in the form of a cross, and somewhat resembling a disused church. It is the old market house of Longford, the lower part of which is arched and is now used as stables, and the large rooms above are occupied as men's rooms. It is called the "Mews" barrack.

At a short distance from this building is the hospital, which is surrounded by the ground of the barrack yard.

Along the boundary walls are stables, barrack offices, the school-room and library, cook-houses, privies, the provost establishment, &c. Behind the new block of soldiers' quarters is a drying ground and exercising ground. The buildings, with the exception of the hospital, are tolerably well placed and arranged for external ventilation.

The barrack-rooms vary, of course, in their construction in the different buildings. Those in the new barrack (houses D and E) are tolerably good rooms arranged in two stories. The entrance to them is from a narrow ill-paved court behind. A good passage and stone staircase give access to the rooms right and left. There are four soldiers' rooms and two serjeants' rooms in each house. The rooms are about 30 feet in length, 18 feet in breadth, and they are from 11 feet 2 inches to 13 feet 3 inches high. They have each three windows, and the lower rooms have wooden ceilings. Several of the rooms have a serjeant's berth in one corner.

The rooms in the "Mews" barrack not having been originally intended for soldiers' rooms, are in some respects not so good as those in the newer buildings. The barrack is divided irregularly into flats, with good roomy staircases and passages, but the rooms themselves are of very different sizes, and several of them are gloomy and nearly dark at one end. This defect can however be remedied in the manner we shall point out.

There are only four soldiers' rooms in this barrack, but there are a number of smaller apartments used as serjeants' rooms, mess-room, workshops, stores, &c. So far as concerns the men's accommodation, the following table gives it for the whole barrack, in contrast with what it would be at 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| D House. | | | |
| 1 - - | 15 | 11 | 4 |
| 2 - - | 13 | 10 | 3 |
| 3 - - | 15 | 12 | 3 |
| 4 - - | 15 | 12 | 3 |
| E House. | | | |
| 1 - - | 13 | 10 | 3 |
| 2 - - | 13 | 10 | 3 |
| 3 - - | 15 | 12 | 3 |
| 4 - - | 16 | 12 | 4 |
| Mews. | | | |
| 2 - - | 6 | 5 | 1 |
| 5 - - | 20 | 16 | 4 |
| 6 - - | 20 | 16 | 4 |
| 9 - - | 7 | 5 | 2 |
| Total - | 168 | 131 | 37 |

The rooms have accommodation for 131 men, at about 600 cubic feet per man, and the regulation number should be fixed at that amount.

None of the rooms are ventilated at present, but it was stated to us that glass louvres were about to be placed in the windows. These are not suited for large barrack-rooms, and we would recommend that each of the men's rooms in houses D and E should have a shaft carried from the ceiling to above the roof, and two inlets for air of the usual construction, one on each side the room. All the non-commissioned officers' rooms in these blocks should have silk flap ventilators introduced into the chimnies, and the stairs should be ventilated by having perforated glass panes put into the top row of each stair window.

Each of the men's rooms should have a remodelled grate for warming part of the admitted air in winter.

The rooms in the "Mews" barrack require ventilation, and the larger rooms require additional light.

These rooms are 38 feet in length and the windows are at one end, hence the end nearest the door is dark.

The ceilings are partly carried up into the roof, and perhaps the simplest way of lighting and ventilating would be to carry a shaft about 4 feet square from the ceiling, at the end of the room near the door, up to the ridge of the roof. If this shaft were covered by a ventilating lantern above, and plastered inside, it would afford the necessary light, and outlet for the foul air. Fresh air would have to be supplied by two inlets of sufficient area inserted in the end wall opposite the door and close to the ceiling. Should there be any practical difficulty in carrying out this improvement it will be necessary to provide additional windows and ventilating shafts and inlets of the usual construction. Rooms 2 and 9 in the "Mews" barrack would be sufficiently ventilated by a silk flap ventilator introduced into the chimneys, and by one inlet for air. The band-room in the same building should have a shaft and inlet, and all the rooms occupied as serjeants' rooms and workshops should have silk flap ventilators in the chimneys. It would materially improve the ventilation of the whole building to ventilate the stairs, passages, and lobby through the roof.

The fire-grates in rooms 5 and 6 in the "Mews" barrack should have remodelled grates similar to those recommended for the other houses.

The barrack-rooms are lighted by candles. Gas is obtainable from the town works, and one or more ventilated gas-burners should be put up in each barrack-room.

There is no day-room nor cleaning-room, and there is no accommodation for married soldiers except in the men's rooms. There is a ball court, but it is walled only on one side. It requires a corresponding wall on the other side.

There are two school-rooms with ventilation through the ceiling, but they require two inlets each, of the usual construction, and remodelled grates to warm part of the air admitted in winter.

There is a library, but it is not in a room specially appropriated for the purpose.

In the basement of the "Mews" there is a small damp imperfectly-drained room used as an ablution-room. At present this is the only one for the whole barrack, but it is intended to build another. The drainage of the present one ought to be improved.

There are no baths. Two baths should be put up ; one in each ablution-room, properly partitioned off, and with water laid on.

The women's wash-house and the cook-house are in a range of one-story buildings close to the boundary wall, and detached from the barracks.

The wash-house is large, roomy, and well lighted, and partially ventilated, and it has the usual boilers ; but it has no tubs nor gratings, and no means of drying linen. An additional louvre in the roof, fixed tubs with water laid on, and a drying and laundry stove, are required to complete the arrangements of this building.

The adjoining cook-house has boilers and a brick oven recently constructed, a space for which has been taken out of the wash-house. The cook-house requires an additional louvre in the roof for ventilation.

Water is obtained from four pumps, and partly from the roofs. It is stated to be sufficient for present purposes; but it will have to be better distributed, and the supply may possibly have to be extended, to meet the required improvements in the latrines and urinals, both of which should be supplied with water.

Beside the boundary wall, and further down the slope of ground below the wash-house, are a range of privies, with a corresponding range on the opposite side of the exercising ground. They are of the usual ladder form, and are flushed into the adjacent river by surplus water from the wash-house; but the troughs do not admit of water standing in them. They are consequently very offensive. The buildings themselves are of defective construction, and require to be lighted and ventilated.

These latrines should be reconstructed with shallow water receptacles on Macfarlane's principle, in which water will stand, and the whole contents should be flushed out daily. Proper seating, divisions of seats, half-doors, light and ventilation, and a suitable supply of water, are also required.

Close to the privies is a very offensive ash-pit. It is not so near the barracks as to require removal altogether. It should, however, be reconstructed, by being raised a few inches above the level of the ground, and properly drained and paved; and provision should be made for the more frequent removal of all the barrack refuse.

At one end of the new barracks, and close to the boundary wall, is the provost establishment. It consists of three good cells, entering from a passage of the usual construction, but which requires additional ventilation. The back yard is very narrow, and the whole building is rather confined for space. Its chief defect, however, is an open privy over a cesspit in the back yard, the effluvia from which pervades the whole place. The drainage requires to be reconstructed, the cesspit abolished, and the privy converted into a proper water latrine. The provost-serjeant's quarter requires a silk flap ventilator into the chimney.

On the same side of the parade ground there is a good riding school, which appears to be sufficiently ventilated through the roof. It is, however, rather dark, and would be much improved by two large skylights of rough plate glass.

The canteen tap-room is not ventilated. It requires a silk flap ventilator, and a perforated pane of glass in the upper sash of each window.

The guard-room is not ventilated. It requires a shaft through the roof and a remodelled grate. The adjoining cells are ventilated.

Except in the case of the stables under the "Mews" barrack, which are arched in masonry, all the stables are in one-story buildings, separate from the men's quarters. They are ventilated, but hardly sufficiently so, and they would all be improved by additional outlets at the ridge. It would be a great improvement also to admit more light, as all the stables are dark and gloomy. The pavement is of the ordinary rubble kind, and is complained of. It cannot be kept sufficiently clean, or well drained. The only remedy for these defects is to repave the stables and the ground in front of them with well laid and closely fitting square setts.

The forge is too small for the size of the barrack.

A great defect in these barracks is the want of water-closets in the officers' quarters, and the offensive nature of the present latrine arrangements. In this instance, proper water-closets are much required.

*The following are the Sanitary Improvements we propose for Longford Cavalry Barracks:—*

1. Reduction in the numbers of men in the barrack-rooms, to the extent indicated in the preceding table.

2. Ventilation and warming of the men's rooms in houses D and E by shafts, inlets, and remodelled grates, as described; ventilation of the non-commissioned officers' rooms by silk flap ventilators into the chimnies; ventilation of the staircases and passages by perforated glass panes in the top of each stair window.

Ventilation and lighting of the large rooms in the "Mews" barrack by a large shaft four feet square, carried up from the ceiling of each room at the dark end, through the roof; the shaft to be covered above by a ventilating lantern. Or, if this cannot be done, light to be obtained by additional windows, and ventilation by shafts of the usual construction carried from the ceiling to above the roof. Each of the large rooms to have two inlets for air, and remodelled grates. Rooms 2 and 9 in the "Mews" barrack to have each a silk flap ventilator and one inlet for air. All the other occupied rooms to have silk flap ventilators into the chimnies. Staircase, passages, and lobby in this barrack to be ventilated through the roof.

School-rooms to have each two inlets for air and remodelled grates. Passage of the provost establishment to be ventilated by perforated glass panes. Provost-serjeant's quarters to have a silk flap ventilator.

Canteen tap-room to have a silk flap ventilator and perforated glass panes. Guard-room to be ventilated by a shaft and remodelled grate.

3. Gas to be laid on to the barrack, and one or more ventilated gas-burners to be put into each barrack-room.

4. Ablution-room under the "Mews" barrack to be better drained. An additional ablution-room to be built. Two baths, with water laid on, to be provided.

5. Women's wash-house to have additional ventilation; to be provided with fixed tubs and water laid on, gratings for the feet, and a drying and laundry stove.

6. Ventilation of the cook-house to be improved.

7. Barrack privies to be supplied with water, and reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation, and the cesspits to be abolished. Privies in the provost establishment to be drained, supplied with water, reconstructed as water latrines, and the cesspit to be abolished. Officers' quarters to be supplied with water-closets.

8. Ash-pit to be raised, paved, and drained.

9. Riding school to have glass slabs in the roof. Stables to be better lighted and ventilated, and the paving to be relaid with square setts.

### *Longford Barracks Hospital.*

The hospital accommodation for the cavalry and artillery barracks consists of a house, situated within the cavalry barrack yard, close to the men's quarters and stables, and having no enclosure excepting a small back yard surrounded by a low wall, within which are placed the hospital offices.

The hospital itself stands on an arched basement between five and six feet high. It is too damp and low to be of any use except to cut off the hospital from the damp undrained ground on which it is built. Above this basement are two flats of wards and offices. On the ground floor are the surgery, serjeants' room, and two wards; and there are four wards in the flat above, which are reached by a passage and staircase running from front to back of the building. The wards are back to back; four of them have two windows each, on one side, and two have only one window each. The wards are, four of them about 24 feet long, and two of them about 16 feet long. They are all extremely narrow, being

little more than 14½ feet wide, and they vary in height from 9 feet 6 inches to 11 feet 4 inches. The fireplaces are in two angles. The total accommodation is for 24 beds, disposed as follows :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| No. 1 | 5 | 3 | 2 |
| 2 | 5 | 3 | 2 |
| 3 | 5 | 3 | 2 |
| 4 | 5 | 3 | 2 |
| 5 | 2 | 2 | – |
| 6 | 2 | 2 | – |
| Total - | 24 | 16 | 8 |

The wards are unventilated, and will each require a shaft carried up from the ceiling to above the roof, and an inlet for air, of the usual construction, placed close to the ceiling. The fire-grates should also be remodelled to warm part of the admitted air.

The staircase should be ventilated by perforated panes in the stair windows.

The wards are lighted with candles. Gas can be obtained, and a ventilated gas-burner ought to be introduced into each ward.

Besides the wards in the main building there is a separate itch ward in the back yard ; and under the same roof, close to the entrance to this ward, is a very offensive privy without proper drainage or ventilation. This privy, like the others belonging to the hospital, is placed directly over an open sewer, the contents of which are never properly carried off. Indeed the whole drainage of this hospital is in a very bad state, and requires reconstruction. It may merely be stated, in illustration of this, that the kitchen drainage is allowed to find its way along an open gutter directly under the ward windows to the sewer already mentioned, into which it empties itself very imperfectly by an untrapped opening.

There are neither water-closets, ablution-room, nor bath-room in the building. It would be easy to construct these necessary parts of a hospital, so that that the sick could reach them under cover, and this ought to be done.

Another deficiency is a women's wash-house, for want of which the hospital washing has to be done in the dead-house.

There is neither pack store nor provision store, although possibly space might be found for them in the basement, if the building were thoroughly drained so as to remove the damp.

There is no accommodation for orderlies. It is necessary to notice here a circumstance which has come before us on several occasions, namely, that although the number of sick in this hospital was considerably less than the regulation number, the wards were very much overcrowded. This, in the present case, arose from the fact that some wards had all the sick crowded into them which ought to have been dispersed over the hospital. There should be an order or regulation to prevent this practice in future.

*The following are the Sanitary Improvements required for this Hospital :—*

1. Reduction of the number of beds in the wards to the extent stated.

2. Ventilation of the wards by shafts, inlets, and remodelled grates, and ventilation of the staircase by perforated glass panes in the windows.

3. A ventilated gas-burner to be introduced into each ward.

4. Hospital to be properly drained. Privies to be reconstructed as water latrines on Macfarlane's principle. Two water-closets, an ablution-room, with a bath, and hot and cold water laid on, to be built in connexion with the wards.

5. A proper wash-house to be provided.

### 2. Longford Artillery Barrack.

This is a fortified barrack, situated at about a mile from the town of Longford. It is constructed as a square fort, with an area of three acres within the enclosure. It stands in an open, elevated, and healthy position in the country, and was erected about 50 years ago. The river Camlin passes within about a mile of the boundary.

The buildings are arranged in square. Those on either side the entrance consist of a long range of two-story buildings, with men's rooms over gun-sheds. Another range of one-story men's rooms, like huts placed end to end, runs at right angles to the front range. The other two sides consist of one-story buildings used as stables. The general arrangement of the buildings is good, convenient, and healthy, but the barrack-rooms differ considerably in their structure.

Those over the gun-sheds (Nos. 1, 2, and 3 in the following table) are long low rooms carried up into the roof. They are ceiled, but the windows are only 28 inches high, and there is a large unventilated space above them; and the rooms are deficiently lighted.

The other rooms are very good, light, and airy. Both sets of rooms are provided with windows on opposite sides, but most of the windows are very low. The total accommodation in the barrack is for 106 men, and the following table shows the allotment of the accommodation :—

| Rooms. | Present Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 9 | 7 | 2 |
| 2 | 8 | 6 | 2 |
| 3 | 17 | 13 | 4 |
| 6 | 18 | 14 | 4 |
| 7 | 18 | 14 | 4 |
| 8 | 18 | 14 | 4 |
| 9 | 18 | 14 | 4 |
| Total - | 106 | 82 | 24 |

These barrack-rooms will accommodate 82 men in the proportions per room given in the table, with a cubic space of as nearly as possible 600 cubic feet per man.

There are serjeants' berths in four of the rooms, occupying a window each, and there are two good staff-serjeants' rooms.

None of the rooms are ventilated. Those over the gun-sheds require a shaft to be carried from the centre of the ceiling up above the roof, and inlets for air on the opposite sides close to the eaves.

Rooms 6, 7, 8, 9, have each two fireplaces, and they may be ventilated by building up one of the fireplaces and making an opening into its chimney, close to the ceiling, to convert the flue into an outlet. The sectional area of the opening should be double the area of the chimney. Two inlets for fresh air of the required area should also be introduced, one on each side the room, but not exactly opposite each other.

All the fire-grates are of the old pattern, and consume a great deal of fuel. They should be reconstructed, with means of warming part of the admitted air in winter.

The barrack-rooms are lighted by candles at present. Gas should be laid on, and a ventilated gas-burner introduced in each room. The tube for conveying away the products of combustion ought to

terminate in the outlet ventilating shafts to increase their draft.

This barrack is deficient in the following accommodation :—

Day-room, school-room, library, ablution house, bath, women's wash-house, cleaning shed, and workshops.

It would be difficult to find space for all of these requirements of larger barracks; but a proper ablution house, with one bath, and also a wash-house, with means of drying linen, should be provided.

There is a cook-house, with boilers and an oven, at one end of the side ranges of barrack-rooms. It appears to be sufficient.

Water for all purposes is derived from two pumps in the barrack yard. It is stated to be good. There is surface drainage, but there is no drainage for the privies, which are placed over cesspits, and are in a very offensive state. There is no available outlet for this kind of drainage, and before altering the privies it would be requisite to find some means of disposing of the manure. This might be done by conveying the drainage in pipes to a short distance from the barrack, say 500 yards, receiving it into a cesspit, and using the overflow to irrigate land; or if permission could not be obtained for this work, an arrangement might easily be made, whereby the contents of the latrine might be removed daily in a water cart, as is done in Glasgow. This would answer every purpose, so far as health is concerned. The latrines should at the same time be reconstructed with divisions of seats, half-doors, light, and ventilation.

There is a small guard-room which requires ventilation by a silk flap ventilator into the chimney, a remodelled grate, and an inlet for air, which could easily be made out of one of the existing loop-holes.

There is one cell opening out of a gun-shed at a short distance from the guard-room. It has only 210 cubic feet of contents, and is not fit for any but the most temporary occupation by a prisoner.

*The following are the Sanitary Requirements for Longford Artillery Barracks :—*

1. Reduction of the number of occupants in the barrack-rooms as pointed out.

2. Ventilation of all the rooms by shafts, inlets, and remodelled grates, in the manner described. Ventilation of the guard-room.

3. A ventilated gas-burner to be provided for each room.

4. An ablution-room with one bath to be provided, also a women's wash-house, with the means of washing and drying linen.

5. Privies to be reconstructed as water latrines on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation, and their contents to be disposed of in one of the ways pointed out.

## II. MULLINGAR INFANTRY BARRACKS.

These barracks are situated at about a quarter of a mile from the town of Mullingar, in a somewhat raised and open position.

The buildings are arranged on three sides of a hollow square closed at the angles. In the centre are the officers' quarters; the men's quarters being in the wings or sides of the square.

Behind the end of the men's quarters on one side is the hospital, and on the other side the canteen.

Along the side boundary walls, behind the men's rooms, are the ablution houses, wash-houses, cells, privies, urinals, &c., and near the front entrance on one side is a good chapel school recently built. All the structures are of stone, and the barracks are three stories high.

The internal arrangement of the men's rooms is similar to that of most other Irish barracks. The rooms are arranged in ten houses, five on each side the square, and they are reached by passages going through and through each house, and good stone stairs leading to the upper flats. Two men's rooms open out of each landing right and left, and in each stair there are three serjeants' rooms, one on the ground floor, and the others taken off the stair at the landings above.

The barrack-rooms go through and through the buildings, and have two windows on each of the opposite sides, except in the case of the end rooms, in which the windows are on two adjacent sides.

In one range the ground-floor rooms are flagged, and in the other they are boarded. The flagged floors, except in the kitchen, should be all boarded. Some of the ceilings are boarded and others are of plaster.

The rooms are 30 feet long by 20 broad, and they vary from 11 to 10 feet in height. There are 53 rooms in all, with regulation space for 17 men per room, or 901 men, and there are 31 serjeants' rooms with one man per room. All the rooms are much overcrowded, as will be seen from the following table of the regulation accommodation, and what it ought to be at 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Number of Men per Room at 600 Cubic Feet per Man. |
|---|---|---|---|---|
| Houses A, B, C, D, E, 16 | 272 | 176 | 96 | 11 |
| A, B, C, D, 9 | 153 | 99 | 54 | 11 |
| O, P, Q, R, S, 17 | 289 | 187 | 102 | 11 |
| 11 | 187 | 110 | 77 | 10 |
| Total | 901 | 572 | 329 | — |

These rooms will hold 572 men with exactly 600 cubic feet each, while the present regulation space varies from 353 to 388 cubic feet per man. The overcrowding, considering the number of men massed together, is therefore very considerable. To make the required reductions, the regulation number in all the 11-feet high rooms, should be 11 instead of 17, and in the 10-feet high rooms it should be 10 instead of 17. In this case the height of the room in feet indicates the number of men per room which ought to be placed in it.

The non-commissioned officers' rooms have from 900 to 1,760 cubic feet each.

Each men's room has windows with hanging sashes of the usual construction, but no special means have been provided for ventilating the rooms.

This defect can be easily and cheaply supplied by making use of a second blank chimney, which exists in every room. This chimney is built up below, but as the chimney shaft is open above it can easily be converted into a sufficient ventilating shaft by simply making an opening into it close to the ceiling of each room. The sectional area of this opening ought to be double that of the chimney, and it should be covered by a very open grating, so as not to obstruct the upward current.

Two inlets for air, of the usual construction and area, will have to be provided, one on each side the room between the windows, close to the ceiling, and each inlet should have the usual perforated zinc diffusing cornice.

All the grates are of the old pattern, and waste much heat up the chimney. They ought to be reconstructed to warm part of the admitted air in winter.

All the rooms are lighted by candles. If gas can be obtained from Mullingar it should be laid on to the barracks, as the distance is not great, and a gas-burner ought to be placed in each room and ventilated into the outlet shaft.

All the serjeants' rooms require silk flap ventilators into the chimnies.

Each staircase also should be ventilated by a shaft, nine inches square, carried up from the ceiling through the roof, and by panes of perforated glass being placed in the upper sashes of the stair windows.

There are several men's rooms used for other purposes than barrack-rooms. These are the serjeants' mess-room, library, tailors' shop, quartermaster-serjeant and serjeant-majors' quarters, and the orderly room. All of these rooms require to be ventilated in the same manner as other barrack-rooms, namely, by an opening into the blank chimney, and by two inlets for air, and remodelled grates.

The chapel school is a very good one, and has both inlets for warm air and roof ventilation.

There are two lavatories, one on each side, built against the boundary wall. They are mere lean-to sheds, long and narrow. They are only 7 feet 8 inches broad. They are fitted up with the usual slate benches and metal basins, with water taps supplied from a cistern. They require gratings for the men to stand on, and pegs in the wall for hanging up coats, &c., while the men are washing.

The ablution sheds themselves have no ventilation, and are dark. They should have louvres, and skylights in the roof to afford the necessary ventilation and light.

There are no baths. One for every hundred men should be fitted up in some convenient situation. Six baths would be sufficient for the reduced number of men shown in the preceding table.

Adjoining the ablution sheds and in continuation of them are the women's wash-houses, long, narrow, imperfectly lighted sheds, very unfit for their purpose. Such as they are they might be improved by skylights, fixed tubs with water laid on, gratings to stand on, and laundry and drying stoves.

In this barrack a very objectionable arrangement of cook-houses has been adopted. It exists in many other barracks, and should be avoided in every case where other accommodation can be found. We allude to the fact that a ground-floor barrack-room in four of the houses has been misappropriated for cooking purposes. Each of these cook-houses has boilers, and brick ovens were being put up in them; but it would have been much more conducive to the health and comfort of the barracks to have removed the whole cooking apparatus to proper cook-houses built behind the ranges. Had this been done four good barrack-rooms would have been restored to the troops in this much overcrowded barrack.

If the present cook-houses must be retained, it will be necessary to ventilate them specially by carrying a shaft 12 inches square from the ceiling of each up through the roof, and by putting glass louvres in the windows.

Water is obtained from five wells with pumps, and one rain water tank with a pump. The supply is deficient at present, but the roof water is not all collected. The wells fail in summer, and when the rain water supply is exhausted it becomes necessary to obtain water from a neighbouring canal.

It is evident that the water supply requires to be extended and improved.

The barracks are surface-drained, but the privies are without drainage, and are connected with cesspits immediately outside the walls, and all are in a most offensive and unwholesome condition. They are of the usual barrack construction, and require to be entirely remodelled. The first thing to be done is to find some method of disposing of their contents, and there are three ways, in any one of which the privy and urinal drainage may be safely disposed of. The simplest method would be to convey the drainage to a distance, say 500 yards from the barracks, and to apply it to land in the way of irrigation. This plan is partially and very profitably in use at Birr, and possibly some neighbouring proprietor of land might be induced to take the drainage for such a purpose.

The next plan would be to adopt the system in use at Glasgow barracks, where the contents of the water latrines are flushed daily from the tank into a closed water cart, and removed by a contractor at his own cost.

Another way would be to turn the drainage into some stream, where it would do no harm, and would not give rise to nuisance. This last, however, is always a wasteful method of disposing of valuable manure, and should not be adopted, unless the cost of removal and of application to agricultural purposes would counterbalance the value of the manure.

In one or other of these ways, however, it is absolutely necessary that the privy and urinal drainage be removed, and when this point is determined the present privies should be reconstructed as water latrines on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation, and the present cesspits should be cleansed and filled up.

There are urinals of slate close to the privies, but they are not supplied with water. This should be done, and the drainage removed along with that from the latrines.

Between the present privies and urinals are placed the ash-pits of the barracks. They ought to be abolished, as they are not in a proper situation, and the barrack refuse ought to be collected and removed once a day in a suitable cart.

The canteen tap-room and the serjeants' room both require ventilation by silk flap ventilators and perforated glass panes in the windows.

The guard-room requires ventilation. It should have an outlet on the plan of Moore's four-part ventilator, carried from the ceiling to above the roof, with louvres at the top, and reverse louvres opening into the guard-room, so as to throw any accidental down-draft towards the ceiling. A remodelled grate to warm part of the air admitted in winter is also required.

There is a provost establishment, with 19 cells, 14 of which have only 384 cubic feet each of space per man. They are far too small, and are besides insufficiently ventilated, and require a small air shaft to be carried up through the roof of each cell. The air is warmed by an open fireplace, which might be advantageously replaced by a small Cundy's stove.

Mullingar barracks are deficient in day-rooms, and in married privates' quarters.

Cleaning is done in a shed built along the boundary wall.

Two similar sheds, 67 feet and 57 feet long respectively, and only about 8 feet broad and 9 feet high, are used for drilling in wet weather; but they are far too narrow, and not large enough for the strength in barracks. There is no verandah in front of the guard-room to afford protection in wet weather.

*The following are the Sanitary Improvements required for the present Buildings:—*

1. Reduction of the numbers of men in each class of rooms to the extent shown in the preceding table of accommodation.

2. Ventilation of each barrack-room and of the serjeants' mess-room, library, tailors' shop, orderly room, quartermaster-serjeants' and serjeant-majors' quarters, by an opening into the blank chimney in each room, double the sectional area of the chimney, close to the ceiling, and by two inlets for air, one on each side, close to the ceiling. Each barrack-room to have a remodelled grate to warm part of the admitted air in winter.

Non-commissioned officers' rooms to have silk flap ventilators into the chimnies.

Stairs to be ventilated by shafts carried from the ceiling to above the roof, and by perforated panes in the windows.

Kitchens to be ventilated by shafts carried above the roof, and by glass louvres in the windows.

Canteen tap-room and non-commissioned officers' tap-room to be ventilated by silk flap ventilators into the chimnies, and by perforated panes in the windows.

Guard-room to be ventilated by a shaft through

the roof, and to have a remodelled grate as described.

Cells to have small foul-air shafts carried from their ceilings to above the roofs, and the passages to be warmed by a Cundy's stove.

3. Ablution-rooms to be lighted and ventilated through the roof, and to be provided with gratings and pegs.

5. A bath-house, with baths in the proportion of one bath to 100 men, and water laid on, to be provided.

6. Women's wash-houses to have skylights, fixed tubs, with water laid on, gratings, laundry and drying stoves.

7. Water supply to be extended and improved.

8. Privies to be drained, or the refuse disposed of in one of the ways pointed out, and to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation. Cesspits to be abolished; urinals to be supplied with water; ash-pits to be removed, and provision made for collecting and taking away the barrack refuse every day.

Lastly, the deficiencies noted above ought to be supplied as soon as practicable, but the sanitary works recommended are of immediate importance, and should be all carried out at once.

*Hospital, Mullingar.*

This building is situated near one corner of the barrack boundary. It has no separate enclosure except a back yard, and no exercising ground for convalescents; but part of the barrack drying ground, which is exactly opposite the hospital, might be cut off and appropriated for this purpose.

The building is divided into two houses, or rather into two hospitals, A and B, with everything in duplicate, surgeries, kitchens, store-rooms, larders, &c. It is three stories high, and the wards are on the first and second floors. A hospital has two floors of wards under its own roof, and also one of the second floor of wards in hospital B, which has to be reached by passing through one of the wards in the top flat of A. The arrangement is an objectionable one, and always to be avoided in hospital construction.

The kitchens, surgeries, and store-rooms occupy the ground floor of each hospital. There is one small hospital-serjeant's room only a few feet square, and quite unfit for such a purpose. There are eight wards and 64 beds, very much overcrowded. Half of the beds have only 529 cubic feet each, and none have more than 624 cubic feet. The following table gives the details :—

| Wards. | Present Regulation Accommodation in Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Bed Spaces. |
|---|---|---|---|
| A Hospital :— | | | |
| 1 - - | 8 | 4 | 4 |
| 2 - - | 8 | 4 | 4 |
| 3 - - | 8 | 4 | 4 |
| 4 - - | 8 | 4 | 4 |
| 5 - - | 8 | 4 | 4 |
| B. Hospital :— | | | |
| 1 - - | 8 | 4 | 4 |
| 2 - - | 8 | 4 | 4 |
| 3 - - | 8 | 4 | 4 |
| Total - | 64 | 32 | 32 |

By removing one half of the beds out of each ward, the sick in both hospitals will have on an average less than 1,200 cubic feet each.

The wards have two windows on each of the two opposite sides; but there are no independent means of ventilation, and the ceilings are too low to admit of the wards being properly ventilated by windows alone without producing drafts. It will be necessary to carry a ventilating shaft from the ceiling of each ward to above the roof, and to introduce an inlet for air, of the usual construction and area, on each of the opposite sides of the ward, close to the ceiling.

The ward fire-grates are of the old pattern, and should be remodelled to save fuel and to heat part of the admitted air.

Each staircase requires ventilation by a shaft 12 inches square, carried from its top ceiling up through the roof, and by perforated glass panes in the windows.

There is no gas in the hospital. If it can be obtained for the barracks, as recommended above, one ventilated gas-burner ought to be introduced into each ward..

There are no lavatories for the sick, and no means of bathing except a very useless metal bath. There are no water-closets.

Projections for containing all of these essential conveniences of a hospital could easily be run up in connexion with the existing buildings. They should be accessible from the staircases. The hospital privies are in the back yard, and communicate directly with cesspits behind the wall. These privies should be reconstructed as water latrines, along with those of the barracks, and the drainage disposed of in a similar manner. The cesspits should be abolished. There is no laundry.

Within each hospital, and under one of the sick wards, are the kitchens. Each kitchen requires ventilation by a shaft nine inches square carried from the ceiling above the roof, and by perforated glass panes in the windows.

There is a large manure pit belonging to the officers' stables close to the hospital. This nuisance should be removed forthwith.

The buildings as a whole are not in a very good state, and some of the floors are far from being firm. The wards will afford only a certain amount of the sick accommodation which the barrack would require if fully occupied, and additional ward space will have to be provided. Perhaps the most economical way of doing this would be to build a new hospital on a better plan than the present one. In the meantime, it would be advisable in this and other similar instances of overcrowding, to provide temporary wooden huts for the sick rather than to fill the wards with them, which cannot be done without risk.

*The following Sanitary Improvements are required for the existing Buildings :—*

1. Reduction of the number of beds in each ward from eight to four.

2. Ventilation of each ward by a shaft carried from the ceiling to above the roof, and by two inlets for air as described. Fire-grates to be remodelled. Stairs to be ventilated by a shaft of 12 inches square, carried through the roof, and by panes of perforated glass in the stair and passage windows. Kitchens to be ventilated by a shaft, and panes of perforated glass in the windows.

3. Water-closets, a lavatory, and bath-room with one bath and water laid on, to be provided for each hospital, and to be accessible from the stairs. Present hospital privies to be reconstructed as water latrines; the drainage to be disposed of as recommended for the barracks, and the existing cesspit abolished.

4. Manure pit near the hospital, belonging to officers' stables, to be removed.

## III.—GALWAY BARRACKS.

There are two barracks at Galway. One within the precincts of Galway Castle, and the other called the "Shamble Barrack," in the middle of the town.

### 1. Galway Castle Barrack.

This is both a cavalry and infantry barrack, and consists of officers' quarters, a single block of men's quarters, wooden stables, a few offices, and the hospital of the station. The buildings occupy an area of 3R. 24P. in extent, surrounded by high walls and

dwelling houses. The site is relatively low, and about 430 yards from the estuary. Taking into consideration the local humidity of the climate, and the other circumstances mentioned, the position of both barrack and hospital is a bad one as regards health. The internal arrangement and structure of the buildings is in keeping with the site of the barrack. The men's rooms are built on the lowest part of the ground; they are closely surrounded by stables and dungheaps; immediately behind them are privies placed over cesspits. The hospital is completely enclosed by walls as high as itself. These defects are incident to the locality and are insurmountable, but something may be done to improve the sanitary state of the buildings. The deficiencies however, are so numerous that it is questionable whether it would not be better to give up the whole place at once and erect a proper barrack and hospital elsewhere.

The soldiers' barrack-rooms are behind the officers' quarters, an arrangement which interferes materially with the external ventilation of the buildings.

The men's rooms are in two houses of three floors each. The lower rooms in both houses have flagged floors. Up the middle of each house runs a wooden staircase, giving entrance right and left to the rooms in the upper floors.

The rooms run through and through the buildings, but they have only two windows, one in front and one in the rear.

The front windows are about 4 feet high by 3 feet wide, but from the peculiar arrangement of the buildings the back windows are no more than 22 inches high, so that the rooms are all gloomy, and have not sufficient window space. The highest rooms are 9 feet 3 inches high, and the lowest are only 7 feet 7 inches high. They are uniform in the two other dimensions, being all 20 feet long by 19 feet 6 inches broad. There are in all 12 rooms, with regulation space for 120 men at 10 men per room. All the rooms are overcrowded, and allow no more than from 289 to 353 cubic feet per man, including the space occupied by beds, &c. The following table gives the details of the accommodation :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A House :— | | | |
| No. 1 - - | 10 | 5 | 5 |
| 2 - - | 10 | 5 | 5 |
| 3 - - | 10 | 6 | 4 |
| 4 - - | 10 | 6 | 4 |
| 5 - - | 10 | 6 | 4 |
| 6 - - | 10 | 6 | 4 |
| C House :— | | | |
| 1 - - | 10 | 4 | 6 |
| 2 - - | 10 | 4 | 6 |
| 3 - - | 10 | 5 | 5 |
| 4 - - | 10 | 5 | 5 |
| 5 - - | 10 | 5 | 5 |
| 6 - - | 10 | 5 | 5 |
| Total - | 120 | 62 | 58 |

At an average of somewhat less than 600 cubic feet of space these rooms will hold no more than 62 men, and this is the maximum number they ought to contain.

None of the rooms are ventilated, and each requires a shaft to be carried from the ceiling to above the roof, and two inlets for air, one on either side the room. More window space is likewise necessary for improving the light.

The rooms have old-pattern grates which ought to be remodelled to save fuel and warm part of the admitted air. Each staircase should be ventilated by a shaft nine inches square, carried above the roof, and by perforated glass panes in the windows.

Candles are used for lighting, although gas can be obtained from the town works. It should be laid over the barracks, and a ventilated burner introduced into each room.

The water supply is derived from a well and from the roofs. Water can be had from the town mains, and a much better supply than the present one might be obtained in this way.

The privy is quite dark; it is over a cesspit, which passes under the floor, and is cleared out every three months when the barrack is occupied. It is close behind the men's rooms, and is in a most offensive condition.

It requires reconstruction as a water latrine, with divisions of seats, half-doors, light, ventilation, and drainage; and the cesspit should be abolished. There is an iron trough for a urinal. It should be removed, and a properly constructed urinal substituted for it.

There is a very imperfect cook-house with three 25-gallon boilers. It has no oven, and requires one, also ventilation through the roof.

The ash-pit adjoining ought to be abolished, and all manure and refuse should be taken away daily. This is absolutely necessary in so confined a locality.

The guard-room is very dark and has no ventilation. It requires a shaft and remodelled grate to warm part of the admitted air.

The adjoining black-hole is very bad. There are three tolerably good cells in another building.

Most of the stables are built against the high boundary walls. They are badly ventilated and have no opening at the backs.

The following are the deficiencies in accommodation in these barracks :—

There is no day-room, school-room, library, store rooms, ablution houses, baths, women's wash-house, cleaning-room, drill shed, workshops, mess-room nor sleeping accommodation for non-commissioned officers, and there are no quarters for married soldiers. At the time the return was made to us there were four married women accommodated in barrack-rooms along with the men.

There are some wooden stables, which have been a long time unoccupied, where part of the accommodation required might possibly be obtained.

Our chief recommendation in regard to this barrack must certainly be its evacuation. If it is deemed necessary for military purposes to locate troops on the site, then it ought to be cleared of all obstructions to external ventilation, high walls, &c. More ground should be added, and a new barrack and hospital built on it.

*With regard to the present Buildings we shall limit our Recommendations to the smallest possible number of Requirements :—*

1st, and most important, reducing the numbers of men on the construction from 120 to 62, in the proportions per room given in the preceding table.

2. Flooring the lower barrack-rooms with wood.

3. Ventilation of each room by a shaft, two inlets, and remodelled grate, as described. Ventilation of the staircase by a shaft and perforated glass panes.

4. Gas to be laid on, and a ventilated gas-burner put up in each room.

5. Town water supply to be laid on.

6. All the privies to be reconstructed as water latrines; with divisions of seats, half-doors, light, and ventilation; also to be drained, and all cesspits abolished. An urinal supplied with water to be constructed.

The ash-pit to be removed, and all stable manure and other refuse to be taken away daily.

7. Cook-house to be ventilated at the roof, and an oven to be put up.

8. An ablution house, with one bath, and water laid on, to be provided.

9. Guard-room to be ventilated by a shaft and remodelled grate.

*Galway Castle Hospital.*

This hospital occupies the worst ventilated part of the barrack enclosure. Part of it is built against the old Castle walls, and there is a narrow footway for sentries directly past the upper ward windows. Outside the wall and contiguous to the hospital is the public slaughter-house of the town of Galway.

The hospital is three stories high. The wards are on two sides of a narrow, confined, enclosed, inner court, with lofty walls completing the quadrangle. This court is entered by a passage through the buildings.

On the ground floor is the kitchen, pack store, surgeon's room, and an itch ward. The surgery is over the kitchen. The sick wards are on the two upper flats; they are seven in number, and have regulation space for 40 beds, and all the sick of both the Galway barracks are received into them.

Four of the wards have only one window each; one ward has two windows, one has three, and the remaining ward has four windows.

The wards on one side of the hospital are deprived of thorough light and ventilation by a glazed passage which gives access to them, and two of the wards which ought to accommodate four patients each have no fireplaces. Six wards are only 8 feet 7 inches high, and one ward is 10 feet 2 inches high. The whole hospital is very much overcrowded, as will be seen from the following table of the accommodation :—

| Wards. | Regulation Number of Beds. | Number of Beds at about 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| No. | | | |
| 1 | 9 | 3 | 6 |
| 2 | 4 | 2 | 2 |
| 3 | 4 | 1 | 3 |
| 4 | 5 | 3 | 2 |
| 5 | 9 | 3 | 6 |
| 6 | 5 | 2 | 3 |
| 7 | 4 | 1 | 3 |
| Total | 40 | 15 | 25 |

Were the building otherwise fit, it might contain 15 sick, and this is the maximum number that ought to be admitted into it, even for a temporary purpose.

It is evident therefore that additional hospital accommodation should be at once provided elsewhere.

In order to improve the structure of the present buildings, it would be most advisable to throw the passages and wards together, by taking down the partitions. This would give larger wards, with windows on both sides, and it would enable the wards having no fireplaces to be used for sick, for which purpose they are unfit at present. While this is being done the whole of the inner walls ought to be thoroughly scraped and limewashed.

The wards will require ventilation by shafts carried from the ceiling to above the roof, and by inlets for air on the opposite sides. The fire-grates should also be remodelled to save heat, and to warm the air introduced in winter. At present there is some provision for ventilation by Moore's ventilators in the windows, but it is by no means sufficient. The staircase should likewise be ventilated by a shaft carried through the roof of the hospital, and by perforated glass panes in the stair windows.

A ventilated gas-burner should be introduced into each ward in lieu of candles, which are at present the only means of lighting.

There is no ablution-room for the sick, and no bath except a very large shower bath in the open air in the yard, which is quite unsuitable for any hospital purpose. There is no water-closet. In the yard are two privies, over a cesspit which has to be emptied through the yard.

These privies should be reconstructed as water latrines, with proper water receptacles, drained, and the cesspit abolished. In so confined a space, there is hardly room for a water-closet, and as the hospital under any circumstances should only be occupied till another can be obtained, it would be sufficient to connect the hospital with the remodelled latrines by a wooden gallery. Space should be found within the building for a bath-room, with one bath and an ablution table.

The kitchen is imperfectly supplied with cooking arrangements, and should have a new range with a roasting oven in it.

The surface drainage of the court yard is very defective on account of the use of boulder stones for paving. There is also a large open grating connected with a sewer, and raised about a foot and a half above the level of the ground. It appears to be used as a sink.

There are other defects and deficiencies in these buildings which need not be enumerated. *Those which it is absolutely necessary to remedy, even for temporary occupation, are the following:—*

1. Reducing the number of beds per ward to the extent shown in the table.

2. Altering the interior by throwing down the partitions of the passages and those between the wards, as described. Scraping and limewashing the whole of the interior walls and ceilings.

3. Ventilating the wards by shafts, inlets, and remodelled grates, and making all the windows to open above and below. Ventilating the staircase by a shaft and perforated glass panes.

4. Introducing a properly ventilated gas-burner into each ward.

5. Providing an ablution and bath room, with one bath, and hot and cold water laid on, within the building.

6. Reconstructing the privies as water latrines, with drainage, and abolishing the cesspit, connecting these latrines with the hospital by a covered passage. Removal of the large grating in the yard, and substituting for it a properly trapped gulley a little below the level of the surface.

2. Shamble Barrack.

This barrack is situated in the heart of the town of Galway. It is closely abutted on by buildings on three sides, and on the fourth side the river Corib passes it within a few feet.

The situation is low, and little raised above the water level. The buildings are arranged in a long narrow court, which is entered by an archway from the public street, so that there is very little efficient external ventilation on account of the arrangement of the buildings and their position.

Within the barrack enclosure there is an area of 1r. 34p. All the buildings are of stone, and date from the year 1749.

The men's rooms are arranged in six houses, each three stories high, and are entered right and left from a central passage and stairs. They are 32 in number, and are all very nearly of the same dimensions. There are 256 men on the present construction, with a cubic space, per man, varying from 342 feet to 412 feet. None of the rooms have more than two small windows, and several have only one window. One set of rooms has windows only on one side, except on the top flat.

As the rooms are low in the ceiling and very imperfectly lighted, the whole aspect of these barracks is gloomy, and the means for ventilating the rooms are most defective.

The following table shows the accommodation in the different houses :—

| Rooms. | Total present Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Number of Men per Room at 600 Cubic Feet each. |
|---|---|---|---|---|
| B. House. | | | | |
| No. 1, 2, 3, 4 | 32 | 20 | 12 | 5 |
| 5, 6 | 16 | 12 | 4 | 6 |
| C. 1, 2, 3, 4 | 32 | 20 | 12 | 5 |
| 5, 6 | 16 | 12 | 4 | 6 |
| D. 1, 2, 3, 4 | 32 | 20 | 12 | 5 |
| 5, 6 | 16 | 12 | 4 | 6 |
| G. 1, 2, 3, 4 | 32 | 20 | 12 | 5 |
| H. 1, 2 | 16 | 10 | 6 | 5 |
| 3 | 8 | 4 | 4 | 4 |
| 4 | 8 | 6 | 2 | 6 |
| 5 | 8 | 5 | 3 | 5 |
| K. 1, 2, 3 | 24 | 15 | 9 | 5 |
| 4, 5 | 16 | 12 | 4 | 6 |
| Total | 256 | 168 | 88 | — |

There is scarcely room for 168 men in these barracks, as the average space allotted in the above table falls below 600 feet.

The rooms have no means of ventilation, and should each have a shaft carried from the ceiling above the roof, with an inlet for air from the court. This inlet should be placed close to the ceiling of the room.

The rooms on the upper floor have openings in the ceilings into the space under the roof. These rooms should each have a shaft carried from the centre of the ceiling to above the roof, and one inlet for air.

All the fire-grates are of the old construction, and ought to be remodelled to save fuel and warm part of the air admitted. One 8-men room has been appropriated as a library, and requires to be ventilated, warmed, and lighted like the other barrack-rooms. Each staircase requires ventilation by a louvre, carried up from the top ceiling, and by perforated glass panes in the windows.

The rooms are lighted with candles, and the barrack-yard with oil lamps. Gas can be obtained, and a ventilated gas-burner ought to be introduced into each room.

There is neither day-room nor school-room in these barracks ; there are no ablution houses, baths, nor women's wash-house, and the women are obliged to wash in the barrack-rooms ; there are no cleaning-rooms, drill shed, nor workshops ; and there is no accommodation either for married non-commissioned officers or soldiers. The staff quarters are also stated to be deficient. Notwithstanding the crowded state of the buildings, and the want of so many conveniences, there is a six-horse stable in a corner behind, and at the end of one of the ranges, occupying space and occasioning a certain amount of nuisance. It has been represented to us that this stable is not necessary, as there is accommodation for the staff horses at Galway Castle stables. This being the case, we should advise the removal of the horses, and the stable might then be converted into an ablution house.

Two baths would have to be provided in it, or a proper plunge bath might be constructed close to the water, and might be so arranged that a constant current would pass through it.

It would be very advisable to provide a women's wash-house if space could be found for it.

There is one kitchen, with nine 25-gallon boilers, situated near the stable, and under rooms occupied by men. This kitchen should be ventilated by a shaft nine inches square, carried up above the roof. There is no oven. One to roast meat is required. Opposite the kitchen in a narrow corner is the ash-pit, which is of defective construction, and was very offensive at the time we were there. It is emptied by having the refuse lifted out and thrown through a door in the boundary wall.

It would be very advisable in so close a locality to provide means for the daily removal of all refuse matters ; but if this cannot be done, the ash-pit ought to be removed, and reconstructed opposite the door through which it is emptied. The floor of it should be raised to the level of the door, paved, and drained ; and the ash-pit should be provided with a cover, and a hopper for receiving the dust.

The privies are placed close to the river, over a long deep excavation, through which flows a current of water. The building has no light nor ventilation, except through the door, and the seating is so open that a short time before we were there a man fell through, and was carried away by the stream and drowned.

We would propose to seat these latrines with round openings, to provide divisions and half-doors, and to light and ventilate them through the roof.

Water for these barracks is provided by pumping water from the river every morning into a tank. The supply is unlimited.

The guard-room enters from under the gateway. It requires ventilation by a shaft, and remodelled grate. This grate might be arranged to warm the air in the adjoining cells, which are at present without means of warming.

*The following is a Summary of the Sanitary Improvements required for these Barracks :—*

1. Reduction of the numbers in each barrack-room to the extent shown in the table.
2. Ventilation of each room, and of the library, by a shaft and inlet and a remodelled grate. Ventilation of the guard-room by a shaft and remodelled grate. Ventilation of the stairs by a shaft through the roof, and perforated glass panes in the windows.
3. Barrack to be lighted with gas, and a ventilated gas-burner to be placed in each room and in the library.
4. Horses to be removed, and the stables to be converted into an ablution-room. Bathing accommodation to be provided in one of the ways suggested.
5. A women's wash-house to be provided.
6. Kitchen to have a roasting oven, and to be ventilated by a shaft carried through the roof. Ash-pit to be altered as described, or removed.
7. Latrines to be seated, and provided with divisions, half-doors, light, and ventilation.

While making these recommendations, which if carried out will remove the more urgent sanitary defects in the Shamble barracks, we desire to express our decided opinion with reference to this and to the Castle barracks and hospital, that they are amongst the very worst specimens of public establishments we have seen, and we would strongly advise that they be at once put into as good a state as possible for the sake of their occupants, but that at the same time steps be taken without delay to provide proper barrack and hospital accommodation for this station.

## IV.—ATHLONE BARRACKS.

Athlone barracks, are situated close to the western side of the Shannon, in a position which was formerly of importance in a military point of view.

They consist of three sets of barracks, for artillery, cavalry, and infantry, with a hospital which affords accommodation for the sick of all arms. They are all within the same boundary wall, with the exception of a few rooms belonging to the infantry barracks in the old castle of Athlone, separated from the other barracks by a public street.

Within the barrack enclosure there is an area of 35 acres, affording a large extent of space for parade grounds.

The site is open and healthy, but part of the infantry barracks are close to the houses of the civil population. The site occupied by the buildings is on a slope, falling towards the river, which is separated from the

lower boundary wall by a public highway. The means of natural drainage are sufficient, and there is an outlet direct into the Shannon.

The buildings are arranged in three squares, each arm occupying a square. At the higher end of the ground are the artillery barracks; next, those for cavalry, and the infantry barracks are lowest down and nearest the river. Most of the buildings are of stone, and, excepting part of the infantry barracks, they are well arranged for external ventilation, although they are defective in other equally important sanitary requirements.

The average number of men in the rooms is higher than in most other barracks we have visited. It ranges from 17 up to 25 men per room, and the space allowed by the regulations varies from about 330 to about 450 cubic feet. The mean space is small, and some of the rooms exhibit a considerable degree of overcrowding.

There are five men's rooms in the artillery barracks, eight in the cavalry barracks, 31 in the infantry barracks, and there are six men's rooms in the Castle: 50 rooms in all, besides 10 non-commissioned officers' rooms; and there is accommodation by existing regulation for 978 non-commissioned officers and men.

The following table shows the men's accommodation per room in each barrack, in comparision with what it would be at 600 cubic feet per man:—

| Rooms. | Present Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency in Accommodation in Men. |
|---|---|---|---|
| **Royal Artillery.** | | | |
| D. 1 | 18 | 13 | 5 |
| E. 2 | 18 | 13 | 5 |
| F. 3 | 18 | 13 | 5 |
| G. 4 | 17 | 13 | 4 |
| H. 5 | 17 | 13 | 4 |
| **Cavalry.** | | | |
| B. 1 | 19 | 15 | 4 |
| B. 2 | 19 | 15 | 4 |
| B. 3 | 19 | 19 | — |
| B. 4 | 19 | 19 | — |
| C. 1 | 18 | 15 | 3 |
| C. 2 | 18 | 15 | 3 |
| C. 3 | 18 | 18 | — |
| C. 4 | 18 | 18 | — |
| **Infantry.** | | | |
| E. 1 | 20 | 13 | 7 |
| E. 2 | 19 | 14 | 5 |
| E. 3 | 20 | 14 | 6 |
| E. 4 | 19 | 14 | 5 |
| F. 1 | 16 | 9 | 7 |
| F. 2 | 16 | 9 | 7 |
| F. 3 | 16 | 9 | 7 |
| F. 4 | 16 | 12 | 4 |
| F. 5 | 21 | 16 | 5 |
| J. 1 | 23 | 14 | 9 |
| J. 2 | 23 | 13 | 10 |
| J. 3 | 23 | 13 | 10 |
| J. 4 | 23 | 14 | 9 |
| K. 1 | 18 | 13 | 5 |
| K. 2 | 17 | 13 | 4 |
| K. 3 | 20 | 13 | 7 |
| K. 4 | 20 | 13 | 7 |
| L. 1 | 14 | 9 | 5 |
| M. 1 | 26 | 20 | 6 |
| N. 2 | 13 | 8 | 5 |
| N. 3 | 7 | 7 | — |
| N. 4 | 25 | 20 | 5 |
| N. 5 | 21 | 19 | 2 |
| N. 1 | 21 | 16 | 5 |
| O. 2 | 20 | 15 | 5 |
| P. 2 | 23 | 16 | 7 |
| P. 3 | 7 | 5 | 2 |
| P. 4 | 25 | 19 | 6 |
| P. 5 | 13 | 9 | 4 |
| Q. 1 | 6 | 5 | 1 |
| Q. 2 | 26 | 19 | 7 |
| **Castle.** | | | |
| V. 2 | 6 | 4 | 2 |
| V. 3 | 7 | 5 | 2 |
| V. 4 | 7 | 5 | 2 |
| W. 1 | 12 | 6 | 6 |
| W. 2 | 14 | 6 | 8 |
| W. 3 | 20 | 12 | 8 |
| 50 | 879 | 641 | 238 |

By allowing an average of somewhat less than 600 cubic feet per man these barracks will hold 641 men, in the numbers per room shown in the table; and it will be necessary to provide additional accommodation for 238 men.

The barrack-rooms differ in structure and arrangement, and the sanitary improvements required vary somewhat in each separate barrack; we shall therefore consider each by itself.

### 1. The Artillery Barrack.

In this barrack the arrangement is as follows:—

Two sides of the square are occupied by men's rooms and officers' quarters; another side is occupied by quarters for non-commissioned officers and by shops; and the fourth side is occupied by troop stables. In the centre of the square is a block, containing stables, gun-sheds, harness-room, &c. These buildings are one story high. The men's rooms are all of one size, namely, 36 feet long, 21 feet broad, and 10 feet high. They have each five windows, two to the front, and three small swing sashes to the back, which are only 18 inches high. The door is in the middle of the length of the room, and is protected by a porch outside, and there is an opening into the space above the ceiling for ventilation. This, however, is of very little use, and we would propose to introduce the system which we have adopted in other similar rooms. There are two fireplaces in each room, one of which in several of the rooms is closed up. We should propose to brick up one fireplace in each room, because if remodelled grates be introduced one fireplace would be sufficient to warm the room. We would further propose to make use of the chimney flue of the closed-up chimney, as a foul-air shaft for the room, which could easily be done by making an opening into it, close to the ceiling, with a sectional area double that of the flue. It would be necessary to provide two inlets for fresh air, of the usual construction, one on each side the room, close to the ceiling. The remaining fire-grate in each room should be remodelled to warm part of the air admitted during winter.

Each serjeants' room should have an Arnott's silk flap ventilator introduced into the chimney.

There is one ablution-room, lighted by a skylight. There are no gratings nor pegs. Both should be supplied. There are no baths. It was stated to us that one had been authorized, which would be enough for this barrack.

The cook-house requires ventilation by a louvre in the roof. It has boilers and a bakers' oven.

The privies in the artillery barracks are constructed to be flushed, but the receptacle is very deep and does not hold water. They have no ventilation nor light, except by the door and by two loopholes.

These privies ought to be reconstructed as water latrines, with divisions of seats and half-doors; they should be properly lighted and ventilated, and water should stand in the trough until it is discharged. The adjacent urinals should be supplied with water for cleansing. The artillery guard-room is too dark, and should have a skylight in the roof. It also requires ventilation by a shaft, and remodelled grate. The cells are deficient in ventilation and warming, and should have a shaft, four inches square, carried up through the roof; and a stove should be placed in the passage.

### 2. Cavalry Barracks.

These barracks consist of one range of buildings, with men's rooms in the centre and officers' quarters in the ends. This range forms the upper side of the cavalry square. Troop stables complete the square. In the middle of the square is a range of one-story buildings, containing serjeants' quarters, forage stores, forge, wash-houses, &c. The men's rooms are separate from the stables. They are in two houses, two stories high, with four rooms in each house, entering right and left from the passages and staircases. Four of the rooms are 10 feet 6 inches high, and four are 13 feet high. They are through-and-through rooms, with three windows on each side, but three of the windows to the rear of each building are only three feet high. The rooms, however, are very good, spacious and cheerful.

There is no special ventilation for the rooms, but it can be easily supplied by a similar method to that advised for the artillery barrack. Each room has two chimney flues, one at each end. One of these flues is built up, and by making an opening into it, double the sectional area of the chimney, and close to the ceiling, an outlet shaft could readily be obtained. Two inlets for fresh air would have to be made, one on each side of the room, also close to the ceiling. The remaining fire-grate in each room should be remodelled to heat part of the fresh air admitted in winter.

Additional ventilation should be given to the passages and stairs by panes of perforated glass in the upper sashes of the stair windows. There is a room over the archway in the middle of the range which requires additional ventilation by an inlet. All the non-commissioned officers' rooms require ventilation by silk flap ventilators in the chimnies. The non-commissioned officers' rooms in the square are not very good. Two of them are mere closets, with only 684 cubic feet of space each, and one has a stone floor. One of these rooms smokes very much, and might be improved by contracting the area of the flue behind by means of a remodelled grate.

There is one ablution-room in a building behind the serjeants' quarters in the square. It is at a considerable distance from the men's rooms, and is deficient in some important points. The floor is badly drained, and there is no ventilation. The ablution table has no ledge to keep the water from dashing over on the men. There are no pegs for hanging clothes while the men are washing, and there are no baths. One would probably be enough for the usual strength in this barrack.

The privies are flushed, but are in a most noxious condition. The receptacles are too deep, and water does not stand in them, and there is not sufficient light and ventilation. The paving is also in a very defective state, and retains foul water on the surface.

These privies should be completely reconstructed as water latrines, with shallow receptacles in which water will stand. The paving should be relaid, the latrines properly seated, with divisions and half-doors, and they should be properly lighted and ventilated.

There is a women's wash-house belonging to these cavalry barracks which requires improvement. It has not sufficient ventilation, and should have a louvre in the roof. It should have fixed tubs, with water laid on, and also a drying and laundry stove.

There are no means of cooking except boiling. An oven is required for the cook-house, and a shaft for ventilation through the roof.

More light is required for the stables, and could easily be supplied by skylights. Paving is done with boulder stones, and should be replaced by square setts when relaying is needed. The surface drainage of the square requires much improvement.

### 3. Infantry Barracks.

The soldiers' rooms in these barracks are arranged in squares. They are two stories high, and as a whole are not so good as those in the artillery and cavalry squares. Eight of the rooms in J and K houses, accommodating from 20 to 23 men each, are only 15 feet in breadth, and as they have two ranges of beds, the feet of the beds almost touch each other when folded down. These rooms have six windows, two of which are to the rear. Some of the windows are very small. One indeed in each room is taken up by a serjeant's bunk. The lower part of the windows is fixed, and the upper part is on a pivot, an arrangement which frequently leads to breakage.

Each of these rooms has two fireplaces, one of which, but for the length of the rooms, could easily be used for an outlet shaft by blocking it up below, and by making an opening into the flue, double the area of the flue, as recommended above for the artillery and cavalry barracks. As, however, these rooms are from 48 to 52 feet in length, they will each require four inlets for air, two on each side, placed close to the ceiling but not exactly opposite to each other, and two outlet shafts each. In the upper rooms these shafts should be carried up through the roof in the central line of the ceiling, and at equal distances from each other and from the end of the rooms. In the lower rooms it will be necessary to carry them up in opposite corners.

Both fire-grates ought to be remodelled to warm part of the admitted air in winter.

It will be necessary to ventilate the staircases in these houses by carrying a shaft 12 inches square from the ceiling of the stair through the roof, to be terminated above by a louvre; and perforated glass panes should at the same time be introduced into the upper sashes of each stair and passage window.

All the other rooms require ventilation by a shaft and two inlets for air, and the grates should be remodelled. The stairs and passages should also be ventilated by shafts and perforated glass panes. The upper rooms of each house may have shafts carried from the centre of the ceiling up through the roof, in place of shafts in the corners.

Not a few of the rooms are very imperfectly lighted, and should have the windows enlarged. In the upper rooms additional light should be admitted by skylights.

Another block of building contains soldiers' rooms, library, reading-room, adult and infant school, and lecture-room. All the rooms are dark and unventilated. They require more light by skylights or by enlarged windows, and they should be ventilated by shafts, inlets, and remodelled grates like the other rooms. The staircase also requires ventilation by a shaft and perforated glass panes. The building is very old, and not at all suited for its present purpose. It is not fit for stores, a purpose for which it has been suggested to use it.

There is one ablution-room for the infantry square. It is a narrow lean-to shed, at a long distance from the men's rooms. It is defectively paved and drained. It is dark and unventilated. It has only wooden benches, and has no gratings nor pegs. Close to it is a shed for issuing rations.

This ablution-room should be reconstructed; and as there are no baths, a proper bath-room will have to be built, in which case an additional ablution-room should be constructed at the same time. Six baths will be required for the infantry barrack. An unlimited supply of water for bathing purposes can be obtained from the adjacent river.

There are two good cook-houses, with light and ventilation. Each is supplied with an oven, but the ovens are too small.

The infantry barracks have a good building appropriated as a women's wash-house; but to complete its internal arrangements, fixed tubs, gratings, and a drying stove are required.

Close to the lower boundary wall are the privies of the infantry barracks. They are arranged so that a current of water from the river passes through them. They require proper divisions and half-doors, and light and ventilation through the roof. The yard in front of them is not well paved.

There is a good canteen attached to these barracks, but the tap-room and serjeants' room require ventilation by Arnott's silk flap ventilators, and perforated panes in the upper sashes of the windows.

The guard-room is dark, and not sufficiently ventilated. It requires a shaft, inlet, and remodelled grate, and also additional light. There is a urinal attached to the guard-room, but there is no privy.

### 4. Castle Barrack Rooms.

These rooms are partly in the keep of the old castle, and partly in a separate block of building.

Those in the keep are in three flats, reached by a narrow staircase; and as the walls are very thick, and there are only small openings in them unfit to serve as windows, the chief light and ventilation received by these rooms are from a skylight in the roof, and grated openings in each successive floor under the skylight. At the time of our inspection the rooms were occupied by married soldiers. It would be very advisable to increase the light and ventilation by enlarging the skylight, and by providing a much larger outlet in it for the foul air. The fire-grates should also be remodelled to admit warmed air. Were these improvements carried out, this tower would be placed in as good a sanitary condition as it admits of; but it ought never to be occupied by men except on emergency. It is not fit for a permanent barrack.

The separate building is close to the tower. It is two stories high, and has a passage and central staircase, giving access to two rooms on each floor, of which one is occupied as an officer's servant's kitchen. The rooms have one window each. They are only small rooms, and might be sufficiently ventilated by a silk flap ventilator into the chimney, and by a Sherringham's ventilator in the wall, close to the ceiling.

The castle guard-room is very dark and should have more light by a skylight. It requires a shaft and remodelled grate for ventilation. The barrack privy is behind the guard-room, and requires divisions of seats.

The ash-pit is in a close confined position, and too deep. It ought to be filled up to the surface, and properly paved, drained, and covered.

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Besides the improvements specially required for each division of Athlone barracks, the following additional ones are needed for all of these:—

There is no gas in the rooms. Lighting is accomplished at present by candles and oil lamps. Gas can be obtained, and should be introduced throughout the buildings, and ventilated gas-burners should be supplied to each barrack-room, school-room, reading-room, &c.

There are no day-rooms for the men.

The school accommodation is much too small, and a chapel school would be a great advantage for so large a barrack.

There is no accommodation for married soldiers' families.

There are no cleaning-rooms nor drill sheds.

Properly speaking, there are no workshops.

The officers' quarters require water-closets.

Water for the whole barrack is derived from eight wells and from the river Shannon, from which it is raised by labour supplied within the military prison. The source is unlimited, and water can be laid on all over the buildings.

*The following are the Improvements required for each Barrack:—*

### 1. *Artillery Barracks.*

1. Reduction of the numbers of men in each barrack-room to the extent shown in the table.

2. Ventilation of each barrack-room by converting one of the chimney flues into a foul-air shaft, by providing two inlets for air, one on each side the room, and by remodelling the fire-grate to warm part of the admitted air. Each serjeant's room to have an Arnott's silk flap ventilator placed in the chimney. The guard-room to have a skylight, and to be ventilated by a shaft and remodelled grate. Cells to be ventilated by a shaft through the roof, as described. Cook-house to be ventilated by a louvre in the roof.

3. Ventilated gas-burners to be introduced into each barrack-room.

4. Ablution-room to have gratings and pegs supplied. One bath to be put up, with water laid on.

5. Privies to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation. Urinals to be supplied with water.

### 2. *Cavalry Barracks.*

1. Number of men in each room to be reduced to the extent shown in the preceding table.

2. Men's rooms to be ventilated by converting the chimney flue of one of the fireplaces into an outlet shaft, by making an opening into it close to the ceiling, double its sectional area, and by blocking up the fireplace. Each room to have two inlets for fresh air, one on each side close to the ceiling. The fire-grate of each room to be remodelled to warm part of the air admitted. Non-commissioned officers' rooms to be ventilated by a silk flap ventilator into the chimney. Room over the archway to have an inlet for air close to the ceiling. Passages and stairs to have panes of perforated glass in the upper window sashes.

3. Ventilated gas-burners to be introduced into each barrack-room.

4. Ablution-room to be ventilated through roof, and the drainage of it improved. Ablution table to have a ledge. Pegs and gratings to be supplied. One bath with water laid on to be supplied.

5. Privies to be reconstructed as water latrines, with receptacles in which water will stand. Divisions of seats, half-doors, light, and ventilation to be provided, and the paving to be relaid.

6. Women's wash-house to be provided with a louvre in the roof, fixed tubs with water laid on, and a drying and laundry stove.

7. Cook-house to be ventilated through the roof, and to have an oven put up.

8. Stables to be better lighted by skylights, and the paving and surface drainage to be improved.

### 3. *Infantry Barracks.*

1. Number of men per room to be reduced to the extent shown in the table.

2. Rooms in houses J and K to have each two ventilating-shafts and four inlets for air, with two remodelled grates. The other barrack-rooms to have one shaft and two inlets, with remodelled grates. Staircases to be ventilated by a louvred shaft from the top of each, carried through the roof, and by perforated glass panes in the upper window sashes. Additional light to be given to all dark rooms wherever practicable. Non-commissioned officers' rooms to have silk flap ventilators into the chimnies. School-rooms to be ventilated like the barrack-rooms by shafts, inlets, and remodelled grates; additional light to be admitted to them by skylights or otherwise. Canteen tap-room and serjeants' room to have ventilation by a silk flap ventilator into the chimney, and by perforated panes in the windows. Guard-room to

have a skylight, and to be ventilated by a shaft and remodelled grate.

3. A ventilated gas-burner to be introduced into each barrack-room, school-room, reading-room, and library.

4. Ablution-room to be reconstructed nearer the men's rooms, and a bath-room, with six baths and water laid on, to be provided.

5. Women's wash-house to be provided with fixed tubs, water laid on, and a drying stove.

### 4. *Castle Barrack.*

1. Number of men per room to be reduced to the extent shown in the table.

2. Rooms in the tower to be better lighted and ventilated, by enlarging the skylight and increasing the area of the ventilating shaft. Remodelled fire-grates, for warming part of the air admitted, to be provided. The other barrack-rooms to have silk flap ventilators in the chimnies, and Sherringham's ventilators for inlets. Guard-room to be lighted by a skylight, and to be ventilated by a shaft and remodelled grate.

3. A ventilated gas-burner to be put into each room.

4. Privy to have divisions of seats. The ash-pit to be improved as suggested.

## Athlone Barrack Hospital.

This hospital is situated at the lower side of the cavalry parade ground, and has an enclosure for convalescents. It consists of two hospitals, three stories high, under one roof, with 13 wards, and regulation space for 86 beds, with from 440 to a little above 450 cubic feet per bed. The surgery, serjeant's room, and a small ward are on the ground floor, and the upper floors are occupied by wards. The kitchens, &c., are in an outbuilding behind, connected with the hospital by a covered passage.

The wards are much overcrowded with sick, and the hospital is too small for the strength in barracks.

The following table shows the present accommodation, contrasted with what it would be at 1,200 cubic feet per bed :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| A Hospital :— | | | |
| 1 | 8 | 3 | 5 |
| 2 | 8 | 3 | 5 |
| 3 | 8 | 3 | 5 |
| 4 | 2 | 1 | 1 |
| 5 | 8 | 3 | 5 |
| B Hospital :— | | | |
| 1 | 8 | 3 | 5 |
| 2 | 8 | 3 | 5 |
| 3 | 8 | 3 | 5 |
| 4 | 2 | 1 | 1 |
| 5 | 8 | 3 | 5 |
| 6 | 8 | 3 | 5 |
| 7 | 2 | 1 | 1 |
| 8 | 8 | 3 | 5 |
| Total 13 | 86 | 33 | 53 |

It will be seen that this hospital is very much overcrowded. It has space for no more than 33 beds instead of 86, and even to accommodate the smaller number little more than 1,100 cubic feet per bed can be given.

There is no accommodation for orderlies or attendants on the sick, except a small serjeant's room, and the orderlies have to sleep in the already overcrowded wards among the sick.

We can here only repeat our condemnation of this practice, and strongly recommend that it be discontinued as soon as possible.

It is evident that additional hospital space is required as well as additional barrack space. But the deficiency in accommodation for the sick is the more urgent at present, inasmuch as the average cubic space per bed in hospital is very little more than the average cubic space allowed by present regulation in the barracks.

No part of the present hospital is ventilated, and as each ward has only one chimney it will be necessary to carry a ventilating shaft from the ceiling at the corner of the ward up through the roof, and to provide two inlets, one on each opposite side, close to the ceiling, for admitting fresh air. The ward grates should also be remodelled to warm part of the admitted air.

Each staircase should also be ventilated by carrying a shaft from the ceiling up through the roof, and by perforated panes in the windows.

There are no means of lighting the hospital except by candles. Gas should be laid on, and a ventilated gas-burner introduced into each ward.

There are no proper means of washing or bathing the sick ; a suitable bath-room with an ablution table are much required. As there are two hospitals under one roof, there are two kitchens, and one of them is used as a kind of lavatory, but it is not suitable for such a purpose in its present state.

Water for the hospital is obtained from a well in the yard. It is stated to be ample in quantity, but hard in quality.

There are two water-closets in a projection opening out of the half-landing of the staircase. They appear to be of indifferent construction, as great attention is required to keep them in order.

In the back yard are two privies which are drained and flushed ; but as water does not stand in them, they are offensive. A Macfarlane's water latrine would remedy this evil at once.

There is a deep offensive ash-pit behind the hospital which should be abolished, and the hospital refuse collected and removed from it daily by means of a box or barrow.

*The Improvements required for the present Hospital are the following :—*

1. To remove 53 beds out of it, in the proportions per ward given in the table, and to remove the orderlies' beds out of the wards.

2. To ventilate each ward by a shaft, two inlets, and a remodelled grate, and each staircase by a shaft and perforated glass panes.

3. To introduce a ventilated gas-burner into each ward.

4. To provide an ablution-room, with a bath, and hot and cold water laid on.

5. Privies in the back yard to be reconstructed as water latrines, with receptacles in which water will stand.

6. Ash-pit to be removed, and the hospital refuse to be collected and taken away daily.

Lastly. We beg to state, that rather than incur the cost of these works for the present hospital, it would, in our opinion, be more for the interest of the service to provide a new hospital.

John Sutherland.
W. H. Burrell.
Douglas Galton.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, August* 12, 1859.

# CURRAGH DISTRICT.

Sir,

We have the honour to transmit to you our report and recommendations for improving the barracks at the following stations within the Curragh district :—

I. Kilkenny.
II. Newbridge.
III. Birr.
IV. Carlow.
V. Duncannon Fort.

## I.—KILKENNY.

### Cavalry and Infantry Barracks.

These barracks are situated at a short distance from the town of Kilkenny, on an elevated healthy position, about 400 yards from the river Nore.

They are built within an oblong enclosure, about 15 acres in extent. The subsoil is gravel and sand, and the natural facilities for drainage are good.

There are dwelling-houses in the vicinity, but not in such numbers as to interfere with the external ventilation of the barracks.

All the buildings are of stone. Those for the infantry were erected about 1813, and those for cavalry in 1848. The soldiers' quarters in the infantry barracks, occupying two long blocks in line, extend the length way of the enclosure. The officers' quarters are situated in detached blocks built at each end, and at right angles to the line of the inldiers' quarters. On the north-west side of the soclosure, and parallel to the officers' quarters on that side, are situated the cavalry barracks and quarters in one block. Behind the line of the soldiers' quarters are placed the cook-houses and ablution-rooms ; and behind these again are the hospital, prison, magazine, wash-house, stores, &c. A large chapel school is situated close to the boundary wall on the south-east side of the enclosure.

The general arrangement of the quarters is good and healthy, but in some points, hereafter to be mentioned, the arrangement of the other buildings is faulty.

The infantry barracks are two stories high, and are arranged on the plan common to many other Irish barracks. They are in houses, each of which has a central passage and staircase, with a barrack-room opening out of the landings on each side, and a non-commissioned officer's room between each two soldiers' rooms.

The staircases are of stone, with wooden landings. They have windows to one side only, so that there is no thorough ventilation. It would improve them to carry a shaft from the top ceiling above the roof, and to put perforated glass panes into the windows. A window should also be opened in the blank wall of the staircase.

Most of the barrack-rooms have four windows ; two on each side of the room. A few rooms have three windows each ; and there are three long rooms in the cavalry barrack with eight windows in each.

The rooms generally have two fireplaces, one at each end. One of these fireplaces is blocked up ; and as none of the rooms are ventilated, the chimney shaft of this fireplace might be used as a ventilating shaft, by making an opening into it close to the ceiling, of double the sectional area of the chimney. It would be necessary at the same time to provide an inlet for fresh air between every two windows, back and front, close to the ceiling, and covering the inlet inside by a short cornice of perforated zinc. In the long cavalry rooms two ventilating shafts ought to be carried up from the ceiling in the middle line of the room to above the ridge of the barrack. Each shaft should be at a distance from the end of the room, equal to a fourth part of the length of the room. Each of these long rooms should have four inlets, with perforated zinc cornices, two on each side of the room, not opposite one another.

All the infantry rooms, namely, those in houses A, B, C, D, E, F, are considerably overcrowded, while those of the cavalry, in houses I, J, and K, have an amount of cubic space approaching more closely to that required for health and ventilation. The men's rooms, in houses A, B, C, D, E, and F, are of two sizes. The lower rooms, two in each house, are 33 feet long, by 18 feet wide and 11 feet high, and contain 19 men by regulation. The two upper rooms of each house are of the same length and breadth, but they are a foot lower in the ceiling. They have regulation accommodation for 17 men each.

The cavalry rooms are all 27 feet 6 inches wide and 10 feet 6 inches high. Four of them are 51 feet 6 inches long ; and two are 33 feet 6 inches long.

The following table shows the present regulation accommodation in each house contrasted with what it would be at 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Acommodation in Men. |
|---|---|---|---|
| Houses A, B, C, D, E, F, Nos. 1 and 3 Rooms in each House - - - - | 228 | 132 | 96 |
| Houses A, B, C, Nos. 4 and 5 in each House—D, E, F, Nos. 5 and 6 in each House - - | 204 | 120 | 84 |
| House I, No. 1 - - - | 19 | 16 | 3 |
| „ I, No. 2 - - - | 29 | 25 | 4 |
| „ J, Nos. 1 and 2 | 58 | 50 | 8 |
| „ K, No. 1 - - | 29 | 25 | 4 |
| „ No. 2 - - | 19 | 16 | 3 |
| Total - - - - - | 586 | 384 | 202 |

At 600 cubic feet per man, these barracks have space for 252 infantry and 132 cavalry. In order to give the requisite space, the numbers in each class of barrack-rooms require to be reduced as follows :—

1. In every 19-men room, in houses A, B, C, D, E, F, the numbers should be reduced from 19 to 11 per room.

2. In every 17-men room, in the same houses, the number should be reduced from 17 to 10 men per room.

3. In house I, No. 1, and in house K, No. 2, the number to be reduced from 19 to 16 men per room.

4. In house I, No. 2, in house J, Nos. 1 and 2, and in house K, No. 1, the number of men should be reduced from 29 to 25 men per room.

All the barrack-rooms are lit by candles. There is gas in the neighbourhood, and if it can be obtained at not too great a cost, we would recommend its being introduced for lighting the whole barracks, and that a ventilated gas-burner be supplied to every barrack-room. Two such burners would be required for the long cavalry rooms.

There are no day-rooms for the men.

There is an excellent chapel school, but it is not sufficiently ventilated. It would be much improved in this respect by admitting fresh air over the smoke flues under the floor, and allowing it to enter round the stoves. This arrangement would warm the inflowing air in winter. Outlets should at the same time be provided by raising some of the ridge tiles at intervals along the roof.

There are two very good ablution houses behind the soldiers' barracks. They are large, roomy, light,

and well ventilated. They have gratings and pegs, and are upon the whole the best we have seen.

The slate tables have no ledges to prevent the water running over on the men while washing. This defect could be easily remedied.

There are no baths. One bath is required for every 100 men. There is plenty of space in which to place them.

There is no proper laundry attached to these barracks. There is an ordinary wash-house close to the hospital. It has six boilers, but there are no fixed tubs, and no drying or laundry stove. There is no proper drainage, and the wash tubs are emptied on the floor or in front of the door, the water being allowed to find its way to the nearest drain.

There are five cook-houses, with the usual arrangement of boilers, but there are no ovens or other means of cooking besides boiling. The cook-houses are well constructed, light, and well ventilated. An oven ought to be introduced into each cook-house, or sufficient oven space provided in one or more of the houses to roast the due proportion of rations.

There are no cleaning sheds and no covered drill sheds. Both of these deficiencies should be supplied.

One 17-men room has been struck off the accommodation as a tailor's shop. It requires ventilation. There is one wheeler's shop, one forge, and one collar-maker's shop.

The water supply for the whole barracks is derived from seven pump wells ; it is stated to be sufficient. Part of the roof-water is collected for use.

The barracks are surface-drained, but there are no means of draining the latrines, which are all connected with cesspits, and are in a very offensive state. We would advise the introduction of water latrines, with suitable drainage, in this barrack as well as in the others on which we have reported.

The drainage from the latrines might be disposed of either by being carried to the river or by being used for irrigation at a sufficient distance from the barracks, provided suitable land be available.

The surface drainage near the barrack-rooms is defective on account of the rough character of the paving, and the guttering is not well formed, and permits water to stagnate near the windows. The footways on both sides of barracks ought to be flagged and the gutters carefully formed, and square setts used instead of boulders for ordinary pavement.

As already mentioned, the stables belonging to the cavalry barracks are placed under the men's rooms. We should advise that these stables be efficiently ventilated by shafts carried up through the roof of the buildings, and by perforated glass panes in the stable windows. The ventilating shafts should be of wood, lined with zinc carefully soldered, and should have a sectional area equal to 12 square inches per horse.

In the line of the stables and underneath the barrack-rooms is placed an offensive urinal. There is no reason why it should be there at all, and we would advise its removal away from the buildings.

There are no litter sheds for the stables.

The accommodation for married people consists of one staff serjeant's quarters and 13 small rooms for the serjeants. None of these rooms are ventilated, and they require silk flap ventilators in the chimnies.

There are no serjeants' rooms in the cavalry barracks, and berths are taken off the corners of the barrack-rooms.

The serjeants' mess is in a barrack-room, and is unventilated. The mess kitchen is in a serjeant's room, which has been misappropriated for the purpose.

There are no special quarters for married soldiers.

*The following are the Sanitary Improvements required for these Barracks :—*

1. Reduction of numbers of men in all the barrack-rooms to the extent stated.

2. Ventilation of all the infantry barrack-rooms by making an opening into the chimney of the disused fireplace, close to the ceiling, the opening to have the same sectional area as the chimney. Inlets for air to be provided, one on either side the room between the windows close to the ceiling. Each opening to be covered by a cornice with perforated zinc to diffuse the air. Serjeant's mess to be ventilated in a similar manner. All the serjeants' rooms to be ventilated by a silk-flap ventilator into the chimney. The rooms in the cavalry barracks to be ventilated by air shafts carried from the ceiling to above the roof, and by inlets between the windows, as described. Stables to be ventilated by shafts and perforated panes in the windows. Chapel school to be ventilated as described. Staircases to have additional windows, and to be ventilated by air shafts from the ceiling to above the roof, and by perforated panes in the windows.

3. Each barrack-room to have a ventilated gas-burner, if gas be obtainable.

4. Slate benches in the ablution houses to have ledges put to them, and fixed baths to be put up in the proportion of one bath to every 100 men.

5. Wash-house to be drained, and to be fitted up with fixed tubs and a drying stove.

6. Ovens to be provided for the cook-houses.

7. Cleaning sheds and drill shed to be provided.

8. Privies to be converted into water latrines, with drainage, divisions of seats, half-doors, light, and ventilation, and all cesspits to be abolished.

9. Surface drainage and guttering near the barracks to be improved.

10. Urinals to be improved and supplied with water for cleansing. The urinals under the cavalry barrack-rooms to be removed and reconstructed elsewhere.

Lastly, accommodation should be provided for married soldiers.

### Kilkenny Barrack Hospital.

The hospital of Kilkenny barracks is situated behind the centre of the main line of buildings. On one side of it is placed the women's wash-house belonging to the barracks. Against its end wall on the opposite side, a ball-court has been erected, and close to the ball-court is the magazine, over which sentries are mounted. Immediately behind the magazine are the men's privies. There cannot be a doubt that the position of this hospital is not a fortunate one for the patients, who are constantly liable to disturbance by the noise of the games during the day, and by the pacing and half-hourly calls of the guards during the night.

The buildings are two stories high, with a central passage and staircase. There are three wards on the ground floor ; one of these is placed on each side of the entrance, and the third ward has to be reached by passing through one of the others. On the floor above, the wards are arranged in a somewhat similar manner. There are three wards *en suite* on this floor. The second ward can only be reached by passing through the first ; and the third ward, which is the prisoner's ward, has to be reached by traversing the other two ; so that all the sick in these two latter wards have to be periodically disturbed by the passage of the guard to the prisoners' ward. The arrangement of these wards is most objectionable, and does not admit of alteration. It simply renders them unfit for sick.

Most of the wards have windows on two sides, but they have no means of ventilation. We would propose to ventilate them, by taking advantage of one of the chimney shafts. Six of the wards have two fireplaces each. One of these might be built up, and an opening made into its flue, close to the ceiling of the room. The opening to be double the sectional area of the chimney. It would be necessary to provide inlets for air by two air-bricks, one on each side the ward, between the windows. The openings should have a short cornice of perforated zinc, for diffusing the air, placed over them, inside the ward.

The hospital contains 81 beds, and all the wards

are considerably overcrowded, as will be seen by the following table of the accommodation :—

| Wards. | Present Number of Beds. | Accommodation at 1,200 Cubic Feet per Bed. | Deficiency of Accommodation in Bed Spaces. |
|---|---|---|---|
| No. 1 | 11 | 5 | 6 |
| 2 | 11 | 5 | 6 |
| 3 | 12 | 7 | 5 |
| 4 | 11 | 4 | 7 |
| 5 | 11 | 6 | 5 |
| 6 | 4 | 2 | 2 |
| 7 | 11 | 4 | 7 |
| 8 | 6 | 3 | 3 |
| 9 | 4 | 2 | 2 |
| Total - | 81 | 38 | 43 |

It will be seen that if 1,200 cubic feet per bed be allotted, the wards have space for only 38 beds.

The kitchen is situated under one of the wards, and has no means of ventilation. A shaft twelve inches square requires to be carried from its ceiling above the roof of the building, and perforated glass panes should at the same time be introduced into the windows.

The kitchen requires a new cooking range, and a properly constructed sink ; there is none at present, and all the slops are thrown out on the surface of the back yard, under the ward windows.

There is no ablution-room. There is a bath in a shed in the yard, but it is of an inconvenient form, and the sick have to walk in the open air to get to it.

Water-closets were being put up in the hospital at the time of our visit.

There is a very offensive privy and ash-pit in the hospital yard. The former, with the cesspit belonging to it, ought to be abolished, and a properly drained water latrine, on Macfarlane's principle, substituted. The refuse of the hospital ought to be collected and removed daily, instead of being accumulated so close to the wards in the ash-pit alluded to.

There is no convalescent room, and no place where convalescents can take exercise.

There are other obvious defects connected with the building, which need not be mentioned. Enough has been stated to show how unfit it is for sick. We are glad to find that its unfitness has been already recognized, and that a proposal has been made to convert the present building into married quarters.

This would be the best thing to do with it, and a more suitable building for the sick ought to be constructed on a better site. We shall, therefore, restrict our recommendations only to those improvements which are immediately necessary.

These are as follows :—

1. Reduction of the number of beds in each ward, to give 1,200 cubic feet per bed.
2. Ventilation of the wards and of the kitchen, by shafts and inlets, as described.
3. A new cooking range and sink to be provided for the kitchen.
4. Privy, ash-pit, and cesspit in the yard to be removed. A properly-drained water latrine to be substituted, and arrangements to be made for daily removal of all the hospital refuse.

## II.—NEWBRIDGE.

### Cavalry Barracks.

These barracks are constructed in half squares, on a general plan, similar to that of the barracks at Birr and Templemore.

They are situated close to the village of Newbridge, part of their north-west enclosure wall forming one side of the village street. The river Liffey passes within 50 yards of the north-east side of the enclosure.

The total area within the boundary wall is 40A. 1R. 1P. Its general level is the same as that of the surrounding country, with a gentle slope to the river. The subsoil is clay and gravel. The permanent buildings are of stone, and were finished about the year 1817.

Officers' quarters occupy two sides of the front half square, which is completed by a range of soldiers' quarters extending between the two blocks of officers' quarters. This central range of soldiers' quarters forms also one side of a rear square, which is completed on the other sides by blocks of soldiers' quarters, and by a range of stables.

The cook-houses, ablution-rooms, and a range of stables run down the centre of the back square, and a number of wooden barrack huts have been erected on the spare ground.

The barrack-rooms are detached from the stables, as ought to be the case in all cavalry barracks. They are in houses three stories high. Each house has a separate entrance and staircase, dividing it into two parts ; but as there is an outer door only on one side of the house, there is no thorough ventilation. There are two barrack-rooms and a serjeant's room on each floor. The staircase is of stone. The men's rooms open out of it right and left, one on each side, and the serjeant's room is between them. The ventilation of the staircase is not sufficient, and it might be improved materially by a shaft carried from the top ceiling above the roof, and by panes of perforated glass in the stair windows.

The total construction in the permanent barracks and huts is intended to accommodate 1,278 non-commissioned officers and men, and 750 horses ; but the actual accommodation in the permanent barrack-rooms, at 603 cubic feet per man, is considerably less than this, as the following table will show :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 32 | 512 | 352 | 160 |
| 20 | 320 | 200 | 120 |
| Total - - | 832 | 552 | 280 |

All the rooms in the table have the same length and breadth, namely, 33 feet by 18 feet. The first 32 rooms are 11 feet high, and the remaining 20 rooms are 10 feet high. They are all constructed to contain 16 men each ; but in order to give as near as may be 600 cubic feet per man, it will be necessary to reduce the numbers in the first 32 rooms from 16 to 11, and in the remaining 20 rooms from 16 to 10.

There are 16 wooden huts, with regulation space for 25 men each, 400 men in all ; they are rather low, and they are over-crowded. We should propose to reduce the numbers to 20 men in each, and to improve the ventilation by swing windows at each end, and by louvres in the angle above the windows. At present the huts are ventilated through the roof, but not sufficiently.

None of the barrack-rooms are ventilated ; they have each two chimnies, one of which might be used for ventilating the room by making an opening into it close to the ceiling of double the superficial area of the chimney itself. It will be necessary also to provide two inlets for air, close to the ceiling between the windows, one on each side ; the inlets will have to be covered with short perforated zinc cornices for diffusing the current.

None of the non-commissioned officers' rooms are ventilated ; there are 35 of these rooms, and each of them will require a silk flap ventilator opening into the chimney close to the ceiling.

All the fire-grates are of the old construction, and might be remodelled with advantage to save heat and fuel.

The barrack is lit with candles ; gas is not at present available.

There is no day-room for the men. It has been observed in this barrack that the serjeants' room in the canteen ceased to be needed when a serjeant's mess was provided. In all probability, if comfortable day-rooms were set apart for the men, a similar result would follow as regards the canteen tap-room. It would be much better to provide day-rooms than to extend the canteen, which is otherwise much too small for the barrack.

The library and regimental schools are in barrack-rooms, under the clock-tower ; they require ventilation like the soldiers' rooms. There are no schoolmasters' quarters.

There are two lavatories, with space and basins for 30 men each, or for about a twentieth part of the force. More basins and benches are required, as the present number is quite insufficient. Gratings to stand on, and pegs for hanging clothes on, are also needed. A strong smell of urine pervaded these lavatories, leading to the suspicion that they are used as urinals. An iron coal box supplies the place of a bath in each lavatory.

This species of bathing accommodation is better than none, but suitable fixed baths, in which a man can immerse himself, in the proportion of one bath for 100 men, and with water laid on, should be constructed.

There is no proper laundry for this large barrack ; there are three women's wash-houses, two of which are merely lean-to structures against the enclosure wall. The other is better, but none of them have the requisite means of drying and getting up linen. They have boilers, but they have neither fixed washing tubs, drying stoves, laundry stoves, nor gratings for the feet, and they are deficient in ventilation. All these defects ought to be remedied in the existing wash-houses : but in all barracks of this size a properly fitted laundry for officers and men ought to be provided with as little delay as possible.

The barrack cooking is done in two cook-houses, with fourteen boilers in each. The buildings are large, lofty, and well ventilated, but they require roasting ovens in each.

The serjeants' mess-rooms are each provided with a grate and oven.

There are no cleaning rooms.

There are no covered drill sheds.

The accommodation for trades consists of three small tailors' shops, one shoemaker's, one saddler's, one saddletree maker's, one wheeler's, and two armourers' shops. The barrack-master reports this accommodation insufficient for a cavalry regiment.

Several of the existing shops are dark, and require to be ventilated.

The water supply is derived from 15 pumps, and there are three tanks for the use of the fire-engine. The present supply is stated to be insufficient, and it is, besides, obtained from a subsoil covered with a large population of men and horses, with the surface drainage very imperfect, and a considerable part of the surface washings and other impurities soaking into the ground.

It is not necessary that these wells should be depended on, at least in ordinary times, for the river Liffey, which passes the barrack gate, would afford an inexhaustible supply, if a proper service tank were erected, and the water pumped up into it by a windmill, such as is extensively used for affording power for similar purposes. The tank should be placed at a sufficient height to supply water all over the barracks. The roof-water would, however, be the best for washing, and should all be saved for this purpose.

Although there is a sufficient fall for the drainage of this barrack, the drainage is by no means complete. The drainage at the upper part of the enclosure is entirely on the surface. The surface channel, which runs from the ablution house and cook-house towards the barracks, appears to be used as a urinal. The urinals are all imperfectly constructed and offensive. In consequence of the very defective state of the drains, the effluvia arising from the gulleys is complained of as being at times insupportable.

The privies are of the usual construction, and are placed over soil-pits, emptied by contract. They were in a very bad state when we saw them, and the smell from one of them is stated to be at times so abominable that some of the officers, a few weeks before we were at Newbridge, were obliged to give up their rooms in consequence.

Their is no children's privy, and an open space in rear of the officers' quarters is made to save the purpose of one. The officers' quarters have no water-closets.

One of the most important improvements required for these barracks is the entire reconstruction of the privies as water latrines, with division of seats, half-doors, light, and ventilation. The cesspits ought to be abolished, and all the latrines drained to an outlet. The river Liffey is the natural outlet ; but what is much better, there is a possibility of the drainage being conducted 500 or 600 yards from the barrack, and applied to irrigate land, as has been partially and imperfectly done at Birr. A cesspit placed in the line of the sewer, at a distance from the barrack, to retain the solid matters for manure, and allow the fluids to drain off for irrigation, or, in default of that being carried out, into the river, would effectually remedy the evils complained of.

Water-closets should be provided for the officers' quarters.

All the urinals should be reconstructed on better principles. They should be drained and supplied with water.

The present state of the drainage requires to be carefully examined, with the view of remedying the defects from which the nuisance complained of arises ; and the openings of all drains within the barrack enclosure should be trapped.

The accommodation in this barrack is deficient in many points.

There are no married quarters ; and families are accommodated, or not, in barracks, as there may happen to be unoccupied rooms.

Soldiers' barrack-rooms are occupied as serjeants' mess, orderly room, library, and regimental schools, barrack-master's store, and royal engineers' office. The forge accommodation is insufficient. The officers' mess kitchen is placed under officers' rooms. A detached kitchen should be provided.

The officers' stables are insufficient.

The kitchens allotted to married officers require kitchen ranges. Houses or quarters are required for major-general and staff ; also field officers' quarters. The quarters for non-commissioned officers are also deficient. More troop stores are required. The deficiency of store accommodation is much complained of. The position of the magazine is complained of as dangerous.

The provost cells are ventilated, and the passage is warmed by a stove. The yard is too small ; it contains an ash-pit which ought to be removed, and a privy and cesspit, both of which should be abolished, and a properly drained water latrine substituted.

The guard-room is too dark, and has no latrine attached to it. It requires ventilation.

A site for a chapel school has been under consideration, but the one pointed out to us is too near officers' mess. There is a much better situation on a plot of ground, with trees on it, near the river gate. It has been proposed to use part of this ground as a

burial ground, in the event of a chapel school being built on it; but such a proposal is inadmissable. It is too close to the barrack and school, and if a burial ground is required it should be provided at a proper distance beyond the boundary walls of the barrack.

The stables are well placed as regards the men's sleeping-rooms; but they are too dark and require more window space.

*The following Sanitary Improvements are required for Newbridge Barracks:—*

1. Reduction of numbers of men in each barrack-room to the extent stated. The number of men in each hut to be reduced to twenty.

2. Ventilation of each barrack-room by an opening made near the ceiling into the blank chimney, the opening to have double the area of the chimney. An inlet for air to be made between the windows, back and front, and to be covered with a short perforated zinc cornice within the room. Staircases to be ventilated by shafts through the top ceiling and roof, and by perforated glass panes in the windows. Non-commissioned officers' rooms to be ventilated by a silk flap ventilator into the chimney. Huts to be ventilated by swing windows over the end doors, and by louvres above the windows at each end. All barrack-rooms used as library, school-rooms, serjeants' mess, &c., to be ventilated into the blank chimney, and to have inlets like the barrack-rooms. Canteen tap-room to be ventilated by a silk flap ventilator and by perforated glass panes. Guard-rooms to be ventilated by shafts through the roof and inlets for air.

All the barrack-room grates to be remodelled, to save heat.

3. Lavatory accommodation to be extended, and made commensurate with the wants of the barrack. Gratings and pegs to be supplied.

4. Fixed baths, with water laid on, to be provided, in the proportion of one bath to every 100 men.

5. Wash-houses to be ventilated, and to be properly fitted up with fixed tubs, gratings, and means of drying and getting up linen.

6. Each cook-house to be provided with a roasting oven.

7. Cleaning sheds and covered sheds for drill to be provided.

8. Water supply to be extended and improved by one of the methods mentioned.

9. The whole drainage of the barracks to be improved, and conducted to an outlet for irrigating land, or to the river. All privies to be reconstructed as water latrines, properly drained, with divisions of seats, half-doors, light, and ventilation. Officers' quarters to be provided with water-closets; soil-pits to be abolished. Urinals to be reconstructed, drained, and supplied with water. All drains to be trapped.

10. Privy and cesspit in the provost yard to be removed, and a water latrine substituted. Water latrine to be constructed for guard-room.

Lastly. Married quarters ought to be provided for the regulation proportion of married soldiers.

### Newbridge Barrack Hospital.

This building is situated at the south-western angle of the barrack square. It consists of two separate hospital houses, A and B, exactly like each other; but the hospitals being too small for the force, four hospital huts have been erected in the court in front to afford additional accommodation for sick. Each house is two stories high, and has a central door and staircase, with wards and offices opening out of them. The staircases require ventilation by a shaft through the ceiling and roof, and by perforated glass panes in the windows.

There is a space behind used as an exercising ground. There are five wards in each hospital, and each ward is set apart, by existing regulations, for ten men.

The following table shows the amount of cubic space available for sick:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| A Hospital. | | | |
| 1 - - | 10 | 5 | 5 |
| 2 - - | 10 | 5 | 5 |
| 3 - - | 10 | 4 | 6 |
| 4 - - | 10 | 4 | 6 |
| 5 - - | 10 | 2 | 8 |
| B Hospital. | | | |
| 1 - - | 10 | 5 | 5 |
| 2 - - | 10 | 5 | 5 |
| 3 - - | 10 | 4 | 6 |
| 4 - - | 10 | 4 | 6 |
| 5 - - | 10 | 2 | 8 |
| Total - | 100 | 40 | 60 |

The cubic space within the building is sufficient to accommodate 40 beds and no more.

It need hardly be pointed out to how great an extent the hospital is overcrowded.

One of the 10-men wards is used by the hospital serjeant, and there are no orderlies' rooms, so that in this overcrowded hospital, space has to be found for the orderlies in the sick wards.

There are a few glass louvres for ventilation inserted in the ward windows, but they are wholly insufficient.

There are two fireplaces in each ward, one of which is blocked up. The chimney of this fireplace might be used as a ventilating shaft by making an opening into it of double the area of the chimney, close to the ceiling. The quantity of air admitted should also be increased by making a ventilating opening, with a perforated wire gauze cornice, on each side the ward close to the ceiling.

The grates are of the usual construction, and waste much heat. They should be remodelled on more economical principles.

Over the kitchen there is a ward, which should be ventilated by a separate shaft, as it has only one chimney, and by two inlets like the other wards.

The hospital is lit by tallow candles, no gas being obtainable.

There is neither lavatory nor proper bath-room. There is a slipper bath and shower bath, but the bathing accommodation is quite insufficient.

There is no laundry or wash-house. The dead-house is used for the purpose.

There are two kitchens, one of which has an oven, otherwise the cooking arrangements are very defective, and a proper hospital cooking range ought to be provided forthwith. These kitchens require ventilation by a shaft carried from the ceiling to above the roof, and by perforated glass panes in the windows.

The water supply is derived from a well in front of the hospital. It is stated to be deficient at times. It ought to be extended and improved along with the water supply of the barrack.

The drainage is defective. There is no sink in the kitchen, and the foul water is thrown out into a surface drain in the yard, under the ward windows, whence it flows into a gully-hole close to the building.

There is no water-closet, and the sick have to go some 40 or 50 yards across the court to a privy over a cesspit. There are no latrines for officers. In short, these arrangements are most defective. The urinal, ash-pit, and privy are all in the enclosure, and are injurious to the purity of the air.

The pack store has no shelves. There is no accommodation, nor is there the possibility of finding any, for the sick of soldiers' families.

With regard to the hospital huts, they are of the usual construction; but from being enclosed among walls, without free external ventilation, they ought not to be used for so large a number of sick as they might be, if in an open field.

We are of opinion that the number of sick in each hut should be reduced from fifteen to twelve, and that the ventilation, which is now defective, ought to be increased by a larger amount of outlet at the ridge.

As a whole, this hospital is very deficient in accommodation for such a force; and it ought to be extended on a better plan, and with suitable conveniences. In the meantime, temporary accommodation should be obtained for the excess of sick in it, so that the numbers might be reduced at once.

*The following are the Sanitary Improvements required for the present Building :—*

1. The removal of 60 beds out of the hospital, and the reduction of the number of beds in the huts, from 15 to 12 in each. Orderlies to be removed from wards.

2. Ventilation of each ward by converting one of the chimnies into a ventilating shaft, by an opening of double the sectional area made close to the ceiling into the chimney, and by blocking up the fireplace of the chimney. Two inlets for air covered by perforated zinc cornices to be provided in each ward. Staircases to be ventilated by shafts through the ceiling, and by perforated glass panes in the windows. Kitchens to be ventilated by a shaft carried from the ceiling above the roof, and by glass louvres in the windows. Ward over the kitchen to be ventilated by a shaft and inlets. Ward grates to be remodelled.

3. A lavatory, with fixed bath, and hot and cold water laid on, and two water-closets to be provided, in a situation easily accessible from the wards.

4. A proper laundry to be provided.

5. Kitchens to be provided with ranges capable of cooking hospital diets.

6. Water supply and drainage to be improved along with those of the barracks.

7. The cesspit and ash-pit in the yard to be abolished, and the privy converted into a water latrine, and an additional water latrine to be provided for the officers. Iron barrows to be provided for the daily collection and removal of refuse. Urinals to be supplied with water.

These measures, if carried out, will remove the more obvious defects of this hospital, but nothing short of reconstruction would make it suitable for a force of 1,200 men, if such a force is to be maintained in this barrack.

## III.—BIRR.

### Infantry Barracks.

This large well-constructed barrack is situated about two miles from Parsonstown, and has regulation accommodation for 1,169 non-commissioned officers and men. The barrack enclosure is a long parallelogram, containing an area of 16A. 3R. 19P. The subsoil is a mixture of loam and gravel, with solid rock at a depth of 6 or 8 feet from the surface.

The ground is somewhat elevated above the surrounding country ; the river Brusna runs past it at about a mile distant, but there is a small stream which passes within a quarter of a mile of the barrack.

There are some ranges of houses close to the boundary walls, but the buildings are essentially in the open country, with abundant means of external ventilation ; all the structures are of stone, and they have been built about 48 years.

Their general plan is that of a long central range of soldiers' houses with its axis in the length of the parallelogram of ground ; this range is divided into two parts by an archway and clock-tower in the middle; and at either end of the range there are detached blocks of buildings, consisting of officers' quarters and soldiers' quarters, running at right angles to the main line ; the whole forming two half parallelograms placed back to back. The plan is a very good one for ensuring a free circulation of the external air over all the surfaces of the building.

Between the quarters and the boundary walls of the enclosure are placed the chapel school, the hospital, ablution and wash-houses, the prison, the barrack-master's house and stores, privies, urinals, &c., the canteen, and stables.

The soldiers' rooms are built in 14 houses, each of which is three stories high, and contains six men's and three serjeant's rooms ; there is a good stone staircase in the centre of each house, but there is only one outside door, so that there is no thorough ventilation from back to the front of the house, by doors on opposite sides, such as is provided in some other similar barracks.

The soldiers' rooms enter from each landing, one on each side ; they are all 17-men rooms, and they are all overcrowded, as the following table will show :—

| Rooms. | Total Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 37 | 629 | 407 | 222 |
| 28 | 476 | 252 | 224 |
| Total | 1,105 | 659 | 446 |

The rooms in the first series in the table are 30 feet long, 20 feet broad, and 11 feet high ; those in the second series have the same length and breadth, and are 9 feet 3 inches high.

In order to give, as nearly as may be, 600 cubic feet per man, it will be necessary to reduce the regulation number in each of the first series of 37 rooms from 17 to 11 men per room, and in the second series of 28 rooms from 17 to nine men per room.

The total accommodation will therefore be sufficient for 659 men, and additional barrack-room will have to be provided for 446 men ; that is, if it be considered necessary to keep up the present strength in this barrack.

Each barrack-room has four windows, two back and front ; the heads of the windows do not come to within 18 inches of the ceiling, and the natural means of ventilation are so far defective. Additional ventilation can be supplied in the following manner :—

There are two fireplaces, one at each end of the room ; one of these is blocked up, and the chimney could be turned into a ventilating shaft by making an opening into it close to the ceiling, and placing a grating over the opening ; the effective ventilating area of the opening ought to be double that of the chimney. It will be necessary also to admit fresh air by an inlet between each pair of windows on opposite sides of the room ; this inlet should be near the ceiling, and should have a perforated zinc cornice placed over it within the room for diffusing the air.

There are 39 rooms belonging to non-commissioned officers ; they all require ventilation by means of a silk flap ventilator introduced into the chimney, close to the ceiling of each room.

As the staircases have no thorough draught, it would improve the ventilation of the entire buildings to carry a ventilating shaft from the top ceiling of each staircase to above the roof, and to put a pane of perforated glass into the upper sash of each stair window.

Several soldiers' rooms are used for other purposes, and the barrack accommodation is restricted to the extent of these misappropriations.

There are four 17-men rooms on the ground floor of the houses used as kitchens ; these 17-men rooms

are occupied as barrack stores; one 17-men room is occupied as a rifle lecture-room; one similar room is used as an orderly room; and another 17-men room is set apart as schoolmaster's quarters, the schoolmaster's quarters being uninhabitable from damp. At the time of our inspection there were seven men's rooms occupied as married quarters, containing 21 men, 21 women, and 33 children. These misappropriations deprive the barrack, at the existing rate of men to space, of accommodation for 289 men. Wherever such misappropriations are necessary, the fact should be taken as proving the necessity of erecting proper buildings for the several objects for which the misappropriations are made. We would here repeat an opinion formerly expressed, that the 600 cubic feet of space in a soldier's barrack-room ought to be considered just as essential for his health and comfort as his rations and clothing, and should be as little subject to deduction or misappropriation for other objects, as these are.

All the rooms have the old-fashioned large open grate, which wastes a large portion of the soldiers' fuel; it would be a great economy and comfort to introduce remodelled grates.

The whole barrack is lit with candles; we believe gas could be obtained from the town of Birr, about a mile distant; and if so, each room ought to be provided with a ventilated gas-burner.

There is no day-room for the men; there is a chapel school and an infant school.

The door of the chapel school opens directly to the external air; there should be an inner porch, or double door, to keep cold and wet from blowing in when the outer door is opened. The chapel is damp; it would remove this defect somewhat to admit air for ventilation under the floor to pass over the stove flues, and to enter the chapel by the sides of the stove. Ventilating openings should also be made in the roof.

There is neither privy nor urinal connected with this school, and the want is felt to be a great inconvenience.

The infant school requires ventilation by an opening into the chimney, and inlets for air.

There is a library, occupying a soldiers' room, and a small librarian's quarter. The library should be ventilated by an opening into the blank chimney, in the manner already recommended for the soldiers' rooms.

There are two ablution houses, one for each wing of the soldiers' barrack. They are long, narrow, lean-to buildings, with tables, and water tanks, but having no gratings nor pegs.

The water supply for them is stated to be totally inadequate. They are too far from many of the men's rooms, and the amount of accommodation they afford is insufficient. We ourselves saw the men half-dressed crossing the barrack square, or standing outside in the cold waiting their turn. There should be additional lavatory space provided; more water laid on, and pegs and gratings introduced into each house.

There are no baths; a suitable bath-house, with one bath for every hundred men, and water laid on, ought to be provided. If this house is built in a central position, it would enable an additional ablution-room to be constructed.

There is no laundry; but there are two women's wash-houses in narrow lean-to buildings in line with the ablution houses, cleaning sheds, &c. One of these houses was made out of part of a cleaning shed. They have each two coppers, but they have no fixed tubs, and no gratings for the feet. They have neither laundry nor drying stove. They are, moreover, dark and unventilated, and they are not drained, so that the foul water has to escape over the floor and ground to the gutters outside. The extent of accommodation they afford is also inadequate to the wants of the barrack. They require entire reconstruction, with proper drainage, fixed tubs, and water laid on, a sufficiency of coppers, and means of drying and ironing linen.

As already stated, there are four kitchens in men's rooms, on the ground floor of the soldiers' houses.

They are large, light rooms, with sufficient space, and well fitted up with boilers. They have each an oven, capable of baking three tins of meat, which is about half the amount required. The ovens are not ventilated. The position of these kitchens, under men's sleeping rooms, is objectionable, although this objection could be to a certain extent removed by ventilating them by means of a shaft 12 inches square, carried up through the roof, and by perforated glass panes in the upper sash of each window; they might be also supplied with larger and better ovens, but it is a question whether they ought to be left in their present position. We consider that it would be much better to construct a proper kitchen, and to remove the present ones out of the buildings, a measure which would restore four good soldiers' rooms to the construction of the barrack. If it be deemed, on other accounts, unadvisable to do this, we should recommend proper roasting ovens of double the capacity of the present ovens to be provided, and each kitchen to be ventilated as described.

There is no covered shed for drill, although there is plenty of space for one; the commanding officer considers that no drill shed should be less than 15 feet wide and 75 yards long.

There are two tailors' shops, and two armourers' shops, one in each wing of the barracks; there is no shoemaker's shop. The tailors' shops require ventilation by a shaft and inlets for air, as already described for the soldiers' rooms.

The water supply is obtained from six pump wells, also from a tank supplied by a pond in the drill field; there is, besides, one rain-water tank for the hospital, and two rain-water tanks for the ablution houses. The water derived from all these sources together is insufficient in amount: the wells are sometimes nearly dry; they might be advantageously deepened. A tank for containing 20,000 gallons of rain water was being constructed; this tank is under ground, and the water must be pumped up for use, whereas it might have been collected at a sufficient height to distribute itself by gravitation to the ablution houses and wash-houses. It would be advantageous to construct a supply tank at a sufficient elevation, into which the well water might also be raised for distribution.

Besides these sources of water within the barrack precincts, there is a stream about a quarter of a mile distant, from which an abundant supply might be obtained. Water from this stream is at present brought daily to the hospital in carts by contract.

The only drainage of these barracks is superficial, and the drains receive the ablution house water and that from the wash-houses, hospital, &c. All the inlets of these drains are not trapped as they ought to be. The drainage water has its outlet into an open ditch, which runs across a field behind the hospital. The fertilizing qualities of this water having been recognized, it has been appropriated for irrigating a grass field about 70 yards from the hospital; to do this, the water is pounded in the open ditch and carried along a catch-water drain, from which it is permitted to flow over the field; the result of which operation is, on the one hand, a very large production of grass, and on the other, considerable nuisance to the hospital in certain states of the weather. The occupant of the field, as we have been informed, objects to any interference with this appropriation of the barrack sewage.

The success which has attended the use of the sewage in this instance, clearly indicates the manner in which the sewage of many other barracks may be got rid of. All that is required in the present instance is, that the operation be conducted at a greater distance.

All the privies are undrained; and some of them are a source of great nuisance. They are of the usual construction, and open into cesspits. One large soldiers'-privy is opposite the hospital, and the smell from it causes nuisance within the building.

The first step in remedying this evil is, if possible, to find an outlet for the barrack drainage in the manner stated above, or in some other manner. This is quite indispensable to enable the buildings to be put in a good sanitary condition. All the privies should then be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation, and drained directly into the sewers, which should be carried to a distance of at least 500 yards from the barracks, and the fluid applied for irrigation. A cess-pit might be constructed in the course of the sewer to receive the solid matters, which could be removed from time to time as manure, and the fluid could be conducted onwards to its destination, either for irrigating land, or to an outlet stream. We cannot help thinking that, in a case like the present, where a successful application of sewage to agriculture has been made, there ought to be no difficulty in finding land on which to dispose of the whole barrack sewage. It would be a profitable investment of money to purchase a field for the purpose. In the meantime, the open ditch, which in reality forms the present sewage reservoir, should have a pipe laid in and be filled up, or else arched over At present it is a serious cause of nuisance to the hospital.

The urinals in these barracks ought to be reconstructed on a better plan, and they should have water laid on for cleansing.

Similar improvements are required in the privy and urinal of the provost establishment.

There are two guard-rooms, one at each end of the front wall of the enclosure. One of them has an officers' guard-room with a paved floor instead of wood.

The guard-rooms are dark, and require additional window space, and ventilation by shafts and inlets for air; and the grate should be altered to admit of part of the air being warmed while entering the room in winter.

There is no lock-up room, but there is plenty of space for one. Neither of the guard-rooms has a privy or ablution-room.

The provost cells are very small. Fourteen of them give no more than 382 cubic feet to each prisoner; two give 607 cubic feet, and only one has 807 cubic feet. No prison cell should have less than the cubic contents of the last of these.

The canteen is too small for the number of men in barracks. The serjeants' room and tap-room are paved instead of being floored. These rooms require ventilation by a silk flap ventilator into the chimney, and by perforated glass panes in the windows.

This barrack has no proper officers' mess establishment. The mess is accommodated in officers' quarters. The officers' stable is too dark, and requires ventilation through the roof, and by perforated glass panes in the windows.

*The following are the Sanitary Improvements required for Birr Barracks :—*

1. Reduction of the numbers of men in the barrack-rooms to the extent pointed out above.

2. Ventilation of every barrack-room, and of the library, tailors' shops, and infant school, by an opening into the blank chimney near the ceiling, and by two inlets near the ceiling, one on each side between the windows; the inlets to be covered with a perforated zinc cornice. Ventilation of each barrack staircase by a shaft through the roof, and by perforated glass panes in the windows. Ventilation of all the non-commissioned officers' rooms by a silk flap ventilator into the chimney. Ventilation of the guard-rooms by shafts and inlets. Ventilation of the canteen rooms by silk flap ventilators in the chimnies, and by louvred panes in the windows. Grates in all the barrack-rooms and guard-rooms to be remodelled to save fuel, and heat part of the fresh air in winter.

3. If gas be obtainable, ventilated gas-burners to be introduced into each barrack-room, non-commissioned officers' room, library, and school-room.

4. A day-room and covered drill shed to be provided.

5. Additional lavatory accommodation to be provided. Pegs and gratings required for each ablution house. Baths to be provided, with water laid on, in the proportion of one bath for every 100 men.

6. Women's wash-houses to be entirely reconstructed, with proper accommodation for washing, drying, and getting up linen.

7. Kitchens to be sufficiently ventilated by shafts and by perforated glass panes in the windows, and to have larger ovens ventilated for roasting meat, instead of the present ones.

8. Water supply to be increased and distributed as described.

9. Drainage to be extended, to include the privies, women's wash-houses, &c., and an outlet to be obtained, either by irrigating grass land or into a natural outlet, in the manner described. All privies within the barrack enclosure to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation. Urinals to be improved and supplied with water. A water latrine and urinal to be provided for the chapel school, and a water latrine and ablution accommodation to be provided for the guard-rooms. All drains to be trapped.

10. Officers' stables to have additional window space, with perforated glass panes and a shaft for ventilation.

Lastly. Accommodation for married soldiers is required. The chapel school requires a porch; also air to be admitted over the smoke flues under the flooring and round the stoves, and ventilating openings to be made in the ceiling.

### Birr Barrack Hospital.

This hospital is very unfavourably placed. It occupies one corner of the barrack enclosure, with offensive privies and a drying ground for soldiers' linen in front of it, and the open ditch and irrigated meadow, already mentioned, behind it. The building is three stories high, and consists of two similar houses, with nearly everything in duplicate. In each house there is a central staircase, with wards and offices opening right and left out of it. On the ground floor there is a kitchen and surgery on one side of the passage, and a ward on the other side. At the back are placed the pack and provision stores, and over these stores, on the half-landing, is the hospital serjeant's room. The kitchen is under the wards, and is unventilated. It requires a shaft carried from the ceiling through the roof, and perforated glass panes in the windows.

There are 12 wards and 112 beds in the two hospitals. All the wards are very much overcrowded, as will appear from the following table :—

| Wards. | Present Regulation Accommodation. | Accommodation at 1,200 Cubic Feet per Bed. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| Y Hospital :— | | | |
| No. 1 - - | 10 | 5 | 5 |
| „ 2 - - | 10 | 5 | 5 |
| „ 3 - - | 10 | 5 | 5 |
| „ 4 - - | 6 | 1 | 5 |
| „ 5 - - | 10 | 4 | 6 |
| „ 6 - - | 10 | 4 | 6 |
| Z Hospital :— | | | |
| No. 1 - - | 10 | 5 | 5 |
| „ 2 - - | 10 | 5 | 5 |
| „ 3 - - | 10 | 5 | 5 |
| „ 4 - - | 6 | 2 | 4 |
| „ 5 - - | 10 | 4 | 6 |
| „ 6 - - | 10 | 4 | 6 |
| Total - - | 112 | 49 | 63 |

One of the 6-bed wards in the hospital has not superficial area enough to contain the beds, and in the prisoner's ward the cubic space per bed is only about 300 feet. None of the wards will divide into spaces of 1,200 cubic feet exactly; and the 49 beds, for which there is the accommodation shown in the table, would have each less than that amount. The number 49 represents the maximum number of beds that ought to be left in the wards, and 63 is the number of beds which ought to be removed out of the hospital.

There are no orderlies' rooms, and one orderly sleeps in each ward, or elsewhere, as there may be accommodation. Of course the orderlies' beds must be deducted from the number of beds in the wards, so that, in reality, there would be only 44 beds at 1,200 cubic feet each, available for sick. It would be much better to give the orderlies a ward to themselves, and to remove them from the sick, among whom they should never intermingle, except in the discharge of their duties. In new hospitals, orderlies' rooms, separate from, but overlooking the wards, ought to be provided.

One of the second-floor wards is appropriated to prisoners, which is a constant source of disturbance to the whole hospital from the noise made by the reliefs during the night, as well as by the pacing of sentries to and fro. A proper prison ward adjoining, but not in the hospital, is much wanted.

The wards are not ventilated; the windows are not hung on pulleys, and some of them will not open at top; each ward has a blank chimney, which could be rendered available for ventilation in the manner already described for the barrack-rooms, by making an opening into it of double the area of the chimney, close to the ceiling; an inlet and perforated zinc cornice should also be placed in the wall on each side the wards, and all the window sashes should be properly hung.

There is no lavatory in the building, but there is one in the hospital yard, to reach which the patients have to cross the yard, and they have to stand on the cold flagstones while washing, because there is no grating; there is no bath-room, and no bathing accommodation, except a slipper bath; a proper lavatory and bath-room ought to be connected with the hospital.

The hospital washing is done out of the building, but the patients' linen has to be dried and aired in the kitchen.

The kitchens have the usual hospital cooking arrangements; the range in Y hospital is useless; it ought to be removed, and a good hospital kitchen range, with a hot water boiler, substituted.

The water supply is derived from two sources; rain water is collected in an underground tank, lined with Portland cement, which impregnates the water with calcareous matter, so as to render it useless for certain purposes; the quantity is, moreover, insufficient, and water has to be brought by contract every day from a stream about a quarter of a mile distant.

The drains from the hospital join the superficial drains from the barrack to empty their contents into the offensive open ditch already mentioned. This, and the privies in front of the building, are a serious cause of injury to the hospital.

Recently an addition has been built out behind Y hospital, between two of the ward windows, and in this structure two syphon water-closets have been placed. They are reached from the staircases by a glazed gallery, which closes up one of the ward windows. If the window were opened, the ward would be ventilated from the gallery. This is very objectionable, but cannot be remedied without moving the water-closet.

There are privies in both hospital yards at a distance of 26 yards from the buildings, and this place must be crossed by the sick in all weathers. These privies should be converted into water latrines.

In this same yard there is a deep open ash-pit, which contained a considerable quantity of foul matter at the bottom. This ash-pit ought to be removed altogether, and arrangements should be made for the daily removal of the hospital refuse.

There is no exercising ground for convalescents, although plenty of Government ground might be rendered available by simply knocking down a wall behind.

There is no accommodation for the sick of married soldiers' families.

Considered as a whole, with reference to its position and neighbourhood, as well as to its structure and defects, this building is far from being suitable for the reception of sick. It will require a considerable outlay to make it so; and after all, it will afford cubic space for no more than 44 sick, exclusive of orderlies. The first thing required would be to double its size at least; but rather than do this it would be better to construct a proper hospital, for which an excellent site is at hand, and the present building might be turned to very good use for other purposes.

*In the meantime we would recommend:—*

1. Reduction of the number of beds to the extent stated, removal of orderlies' beds out of the wards, and removal of the prison ward out of the building.
2. Ventilating the wards by an opening into each blank chimney, and by two inlets in the opposite walls as described. Hanging all the windows with weights and pulleys.
3. Additional water-closets, bath-room, with fixed bath, and hot and cold water laid on, and a lavatory to be constructed in connection with the staircases. Privies in the yard to be drained and reconstructed as water latrines.
4. A proper kitchen range and hot water boiler to be put up, and the kitchen to be ventilated by a shaft and perforated glass panes.
5. Water supply to be improved along with the barrack supply.
6. Drainage to be improved along with the barrack drainage, and the open ditch behind the hospital to be covered over or drained and filled up.
7. Ash-pit in the yard to be abolished, and the refuse to be collected and removed daily.
8. Exercising ground, with a covered walk and seats for convalescents, to be provided.
9. The soldiers' drying ground to be removed away from the hospital.
10. A ventilated gas-burner should be introduced into each ward. There is gas in the town of Birr.

Lastly. In any reconstruction of this hospital, accommodation for the sick of soldiers' families ought to be provided.

## IV.—CARLOW.

### Carlow Cavalry and Infantry Barracks.

This barrack has accommodation for 219 non-commissioned officers and men, and stables for 68 horses. It is situated in an open position, at the outskirts of the town of Carlow. The area within the barrack enclosure is 3A. 2R. 10P. The subsoil is sandy.

The buildings are of stone, and were erected at the latter end of last century. They consist of a long centre and two wings projecting in front. The centre has stables on the ground floor, and two flights of barrack-rooms above, and the wings are occupied as officers' quarters. The barrack-rooms are reached by a central staircase, opening into a corridor on each flat, running from end to end of the buildings, and lighted by windows to the external air. The soldiers' rooms open out of this corridor, and their windows face to the back of the barrack. The rooms have windows only on one side and no thorough ventilation. At the end of each corridor is a 15-men room, with windows on two sides, but all the other rooms are very deficient in window space; those on the first floor are dark, and the rooms on the second floor are darker.

This barrack is in a bad state of repair, and it was in a filthy and noxious condition when we inspected it. All the barrack-rooms smelt strongly of ammonia and organic matter, and the odour in some of the upper rooms was sickening. In the state it was in when we saw it, the soldiers' part was hardly fit for occupation.

The following table shows the accommodation in the men's rooms :—

| Rooms. | Total Accommodation by present Regulation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 2 | 11 | 7 | 4 |
| 3 | 15 | 9 | 6 |
| 4 | 15 | 9 | 6 |
| 5 | 11 | 7 | 4 |
| 6 | 11 | 7 | 4 |
| 8 | 11 | 7 | 4 |
| 9 | 15 | 9 | 6 |
| 10 | 15 | 9 | 6 |
| 11 | 11 | 7 | 4 |
| 12 | 11 | 7 | 4 |
| 14 | 8 | 6 | 2 |
| 15 | 11 | 9 | 2 |
| 16 | 15 | 8 | 7 |
| 17 | 10 | 7 | 3 |
| 18 | 15 | 9 | 6 |
| 19 | 11 | 8 | 3 |
| 20 | 8 | 5 | 3 |
| Total - | 204 | 130 | 74 |

This table shows the available accommodation in these barracks at less than 600 cubic feet per man, and it appears that the maximum number they ought to contain is 130 men. The rooms, as already stated, are deficient in light, and they are all unventilated. The ventilation of the stables is also defective, and as the ceilings and floors are porous, the effluvia from the stables have saturated every room in the building.

The first thing to do to remove this nuisance is to ventilate the stables by perforated panes of glass in the windows, and by conveying a shaft from each corner up through the rooms and above the roof. The shaft should be of wood, lined with zinc. Next, every barrack-room should be ventilated by a shaft carried up from the ceiling to above the roof, and by two inlets for air, one to the external air, the other on the side of the room next the corridor, both provided with a perforated zinc cornice.

The corridor itself requires to be ventilated by perforated glass panes inserted into the top row of all the corridor windows, and into the staircase windows ; and a large louvred shaft should be carried from the top of the staircase above the roof of the building.

Additional window space should also be given to all the one-windowed rooms, of which there are ten occupied as men's rooms.

Besides these improvements in lighting and ventilation, all the rooms, corridors, and staircases should be thoroughly cleansed, and the walls and ceilings scraped and washed with quicklime. The stables should also be cleansed in a similar manner.

The barrack offices are situated along the walls in the yard behind the main buildings.

There is no day-room, school-room, nor library.

There is a good ablution house, but it requires pegs and gratings for the feet. It requires additional light, and more ventilation.

There is no bath. Two are required.

There is a small women's wash-house, with boilers, but there are no tubs and no drying stove.

There are two good cook-houses, light and well ventilated. One of them has four boilers, and the other two. There are no other means of cooking, and a proper roasting oven is required. There s a large manure heap close to the cook-house which ought to be removed.

There are no cleaning or drill sheds, and no work-shops.

The water supply is derived from three pumps and a fire tank, which is supplied from the river Burren, at a short distance from the barrack boundary. The amount is stated to be sufficient.

The drainage is simply surface drainage. The privies empty into cesspits. They are of the usual construction and very offensive. They require to be reconstructed as water latrines, with seats, divisions, half-doors, lights, and ventilation. They should be drained to an outlet, and the cesspits abolished. The urinal is of faulty construction, and offensive. It should be reconstructed, and supplied with water.

A canteen is stated to be much required at this barrack. The town shops are at a considerable distance ; there is only one shop near at hand, and the men are overcharged in making purchases.

The guard-room is dark and imperfectly ventilated. It requires more window space, and a shaft and inlet for air. All the fire-grates are of the old pattern, and might be advantageously remodelled to save fuel and warm part of the admitted air. The guard-room fire-grate should be similarly improved.

There is no lock-up room. There are two cells.

*The following are the Sanitary Improvements required for Carlow Barrack :—*

1. Reduction of inmates in each room to the extent stated in the preceding table.
2. Ventilation of the stables by shafts and perforated glass panes, as stated.
3. Ventilation of all the soldiers' rooms by shafts and inlets for air ; ventilation of the corridors by perforated panes of glass in the windows ; ventilation of the staircase by perforated panes, and by a louvred turret ; ventilation of the guard-room by a shaft and inlet. Fire-grates to be remodelled to warm part of the admitted air.
4. Additional window space to be given in the one-windowed barrack-rooms and in the guard-room.
5. The walls and ceilings of the barrack-rooms, corridors, staircase, and stables, to be cleansed, scraped, and washed with quicklime.
6. Ablution house to be supplied with pegs and gratings, and with additional light and ventilation.
7. Two baths to be provided ; with water laid on.
8. Women's wash-house to be provided with fixed tub, gratings, and a drying stove.
9. Cook-houses to have roasting ovens supplied. The manure heap to be removed.
10. The privies to be reconstructed as water latrines, with divisions and seats, half-doors, light, and ventilation, and to be drained. The cesspits to be abolished. The urinal to be reconstructed and supplied with water.

Lastly the pitch paving of the stables and immediate vicinity of the stable doors is insufficient for the preservation of due cleanliness ; and square setts ought to be substituted when the paving is next under repair.

*Carlow Barrack Hospital.*

This is a small hospital situated in a corner of the parade ground behind the barracks. It consists of two small wards on the upper floor, adjoining which are the pack and bedding store. Downstairs is the hospital serjeant's quarters, the surgery, and kitchen.

Each ward is intended to hold six sick, with a cubic space of only 533 feet per bed. Each ward would barely accommodate three beds as a maximum number. The wards have two windows in each side, but they have no means of ventilation.

Each ward requires a shaft and inlet for air of the usual form. The kitchen also requires a shaft carried

up above the roof, and perforated glass panes in the windows. The passage requires a window through the back wall, and perforated glass panes should be introduced to admit air. A ventilating shaft should also be carried up from the ceiling of the staircase above the roof.

There is no water-closet, bath, or ablution-room. There is an offensive privy and cesspit at one end of the building, to which the sick have to resort. There is a shower bath in the dead-house.

The privy and cesspit should be abolished, and a drained water-closet, with covered access from the hospital, provided. A fixed bath should also be put up.

This building, like most others of a similar class, is ill adapted for the reception of sick. All we can do with it is to advise the removal of the more obvious sanitary defects we have described, and which we now sum up.

1. Three beds to be removed out of each ward.

2. The wards to be ventilated by shafts and inlets for air. The staircase to have a window to the back; to have a shaft carried from the ceiling above the roof, and to have perforated panes in the windows. The kitchen to be ventilated by a shaft and perforated panes.

3. A water-closet and bath to be provided, and the present privy and cesspit to be removed.

## V.—DUNCANNON FORT.

This fort, which is intended solely for defensive purposes, is situated on high ground, on the north side and close to the entrance of Waterford Harbour. It consists of various buildings and casemates, apparently constructed at different periods, and not well arranged for barracks. The date of their construction is not known, but is supposed to be in the fourteenth century. All the buildings are of stone.

The area within the enclosure is $2\frac{1}{2}$ acres, and three-fourths of it are surrounded by the sea.

The houses used as barracks consist of two stories and a basement. Part of the basements are occupied as soldiers' sleeping-rooms—a purpose for which they are totally unfit, on account of their being dark, damp, and unventilated.

The upper rooms are, many of them, defectively constructed, and are deficient both in light and ventilation, and, generally speaking, they are considerably overcrowded. There are seven houses of infantry barracks, containing 12 rooms. There are three rooms of artillery barracks, two casemates, and in the governor's house there are seven rooms, temporarily set apart as barrack-rooms. The total regulation accommodation in the fort is for 188 men.

The following table shows the accommodation in each house compared with what it would be at 600 cubic feet per man :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A, 1 | 10 | 5 | 5 |
| B, 1 | 10 | 7 | 3 |
| C, 1, 2 | 64 | 32 | 32 |
| D, 1, 2 | | | |
| E, 1, 2 | | | |
| F, 1, 2 | | | |
| G, 1, 2 | 20 | 10 | 10 |
| Artillery, 1, 2, 3 | 18 | 9 | 9 |
| Casemates, 1, 2 | 16 | 8 | 8 |
| Governor's House 3, 4, 5, 6, 7, 8, 9 | 50 | 25 | 25 |
| Total | 188 | 96 | 92 |

Among these rooms are included the basements, which, as already stated, are unfit for habitation. They must, therefore, be entirely deducted from the accommodation.

Besides the barrack-rooms, there are other tolerably good rooms, which might be appropriated for extending the accommodation. There is a large bomb-proof room, which was formerly an ordnance store, and is not now used. It is dark, and has no fireplace, and it is not suitably ventilated; but, by improving it in these particulars, it might be rendered fit for occupation by troops.

There is also an armoury, now disused, which would afford additional accommodation, if properly warmed and ventilated. As already stated, none of the existing barrack-rooms are ventilated, and many of them are deficient in light.

One of the first improvements, therefore, would be to open additional windows, where practicable, to increase the light where it is required.

Next, all the rooms should be ventilated; but as the number of men in each room (when the numbers are reduced to the extent specified in the preceding table) would only be small, we are of opinion that a large Arnott's silk flap ventilator inserted into each chimney, along with one inlet covered by a perforated zinc cornice, would be sufficient to afford the requisite supply of air. Each grate should also be reconstructed to warm a part of the air admitted during winter.

There is no day-room nor school-room, and, properly speaking, there is no library, although a barrack-room has been temporarily appropriated to this purpose.

There are neither lavatories nor baths.

There is a very defective wash-house, which has no drying stove. There are three boilers in this wash-house, but no fixed tubs, and no water laid on.

There are no married soldiers' quarters.

The cook-house has six boilers, but no other means of cooking; it is dark and ill ventilated. It requires perforated glass panes and reflectors.

The ash-pit is situated in the ditch, at an inconvenient distance from the barracks. There is a small ash-pit opposite the entrance to the artillery quarters, and close to the rooms. It ought to be removed, and proper arrangements made for collecting the barrack refuse, and removing it daily.

There is neither cleaning shed nor workshops in the fort.

There are two wells, one in the barracks, and one in the entrenchment at some distance.

The water supply would be deficient for even ordinary purposes, if the fort were to be fully occupied, and consequently for sanitary purposes there would be none to spare. It is stated by the barrack-master that there is a good supply available in the entrenchment, provided an additional well were sunk.

If this were done, it would be necessary to provide a sufficient water tank, on the highest available ground, and to force the water up to it. The supply would then have to be distributed over the barracks. Water would be economized if the roof water were collected in a separate tank, and used for washing, or flushing the latrines.

The soldiers' privies are drained into the sea, but require water to be provided for enabling them to be reconstructed as water latrines. They also require more light and ventilation through the roof. The latrines in the officers' yards and quarters require to be converted into water latrines, with means of flushing.

The sewers do not pass under any buildings; they are not trapped.

There is a good small chapel; but it requires ventilation by shafts through the roof, and by arrangements for warming the air in winter.

The guard-room requires ventilation.

*The following are the Sanitary Improvements required for Duncannon Fort:—*

1. Adaptation of the ordnance stores and armoury as additional barrack accommodation, by increasing the light where deficient, supplying fire-grates, and ventilating the buildings by shafts and inlets.
2. Evacuation of the basement barrack-rooms, and reduction of numbers in the other barrack-rooms to the extent specified above.
3. Opening additional windows into imperfectly lighted rooms, and ventilating all the rooms in the manner specified. The passages and staircases to be ventilated by perforated glass panes in the windows, and the barrack-room grates to be remodelled as suggested.
4. The chapel and guard-room to be ventilated, and to have remodelled grates for warming the air in winter.
5. Kitchen to be provided with a roasting oven, and to be ventilated by perforated glass panes, and lighted by reflectors.
6. Water supply to be increased by an additional well and tank, by collecting the rain water, and by pipes for distribution.
7. A lavatory, with two baths, and water laid on, to be provided.
8. Wash-house to be reconstructed, and to have a drying stove provided.
9. All drains to be trapped. All privies to be reconstructed as water latrines, and provided with means of daily flushing. Arrangements to be made for the daily removal of the barrack refuse.

### Hospital, Duncannon Fort.

Properly speaking, there is no hospital in this Fort, but only two barrack-rooms, in the upper flat of one of the houses, set apart for sick. These rooms have a water-closet, and an entrance from the *terreplein* of the rampart; but they have no attributes of a building for sick. They have regulation accommodation for eight beds, with from 346 to 495 cubic feet of space for each. The rooms are unventilated and dark. There is no accommodation for the hospital serjeant, no lavatory, and no bath-room. There is a slipper bath, but no means of obtaining hot water. There is neither laundry nor kitchen, and there are no stores of any kind.

If the fort were fully occupied it would be found difficult to provide space on which to erect a hospital, and there is no place near at hand to which serious cases of illness could be sent. We must deal with the matter in the best way we can; and perhaps nothing better can be done than to take in a sufficient number of the adjoining soldiers' rooms to give 1,200 cubic feet per bed for eight beds, and to ventilate each room by a shaft through the ceiling and roof, with perforated panes in the windows, and by remodelling the grates to admit warmed air in winter. It would be necessary also to provide a bath, with hot and cold water laid on.

*We would therefore recommend:—*

1. Extension of the accommodation to give 1,200 cubic feet for each bed.
2. Ventilating arrangements as suggested.
3. A bath with hot and cold water to be provided.

Sidney Herbert.
John Sutherland.
W. H. Burrell.
Douglas Galton.

To the Secretary of State for War.
*Barrack and Hospital Improvement Commission, February* 14, 1859.

## NAAS INFANTRY BARRACKS.

These barracks are situated in an open, airy position, about 200 yards from the town of Naas, and at about 300 yards from a branch of the Royal Canal. The area of ground within the enclosure wall amounts to 10A. 2R. 37P. It consists of gravel and clay; and as the position is low, there are not good facilities for drainage. The soldiers' barracks occupy a long range of buildings, with a clock-tower and archway in the middle. In the centre of the enclosure are the officers' quarters. The canteen and barrack-masters' office occupy buildings at the ends of the soldiers' range, and the cook-houses, latrines, &c., are in rear near the enclosure wall. The hospital is placed at the corner of the enclosure most distant from the entrance gate.

The buildings are chiefly of stone, and were finished in 1814. They are on two floors, and of the same general construction as the better class of Irish barracks. They are in houses, each of which has a passage and staircase giving access to two barrack rooms on each floor, and to a serjeants' room between them.

The men's rooms are all of the same size. They are 33 feet long, 18 feet wide, and 9 feet 6 inches high. They have two windows on each of the two opposite sides, and a fire-place at each end, except the rooms next the central archway, which are placed endways, with the two fire-places side by side. The ceilings of some of the lower rooms are boarded: in the upper rooms they are plastered. The firegrates are of the ordinary pattern, and waste a large amount of heat.

There are 21 men's rooms, and 11 rooms for serjeants. The men's rooms have a light cheerful, appearance, but they are considerably overcrowded, for each room has regulation space for 16 men, with only 359½ cubic feet per man. The following is the accommodation contrasted with what it would be at 600 cubic feet per man:—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 21 | 336 | 210 | 126 |

The present construction gives 16 men per room; but as the rooms will not divide equally into spaces of 600 cubic feet, we must give either more or less than that amount per man. Considering the open position and healthy structure of the barrack, we consider this to be one of the cases in which a less amount of space might be given, and we would, therefore, propose to fix the *maximum* per room at 10 men, which is quite the outside number. Six men, therefore, should be removed out of each room.

The rooms have at present no means of ventilation except doors, windows, and fire-places. To supply this want, one of the chimneys should be converted into a foul-air shaft by closing the fire-place and making an opening into the flue, near the ceiling, of double the sectional area of the chimney, to be covered by an open grating. The other fire-grate should be remodelled to warm part of the air admitted in cold weather. Two inlets for the outer air should be made close to the ceiling, one on each side the room, between the windows. The staircases have no windows at the back. They should each have a louvred shaft, nine inches square, carried up through the roof from the ceiling. The serjeants' rooms require Arnott's ventilators in the chimneys.

One of the barrack rooms is fitted up as a library. It also requires ventilation by a shaft and inlets, and the grate to be remodelled.

The serjeants' mess and kitchen occupy a barrack room, with the school-room under it; both rooms

require ventilation in the same way as the barrack rooms.

The barrack rooms are lighted with candles. Gas does not appear to be obtainable at present.

There are no tailors' nor shoemakers' shops, both of which are much required.

The canteen tap-room and non-commissioned officers' rooms require the usual ventilation by Arnott's valves and perforated glass panes.

The orderly room adjoins the guard room, and is complained of as being too small.

The guard room is very dark, and requires an additional window. It is not ventilated. A shaft about one foot square, on the principle of Muir's four-point ventilator, should be carried through the roof, and a remodelled grate should be substituted for the present one.

The guard room has a urinal made of porous material, but no privy or ablution room. There is no lock-up. The present orderly room might easily be converted into one, provided a better orderly room were built.

The provost cells appear to be sufficiently ventilated, although like many other provost cells they are very small; three of them have only 450 cubic feet each of contents. They have a privy, cesspit, and ashpit all within the yard. Both ashpit and cesspit ought to be abolished, and the privy drained and converted into a water latrine.

The ablution room is small for the number to be accommodated; it has a slate table, but neither bead, pegs, nor form. There is a grating in one part only. There is no bath, but only a coal-box sometimes used for the purpose; two proper baths with water laid on are required for the reduced strength given above. Water for the ablution table is laid on from a cistern, into which it is pumped up by hand labour.

There is one women's wash-house, with four boilers, but no fixed tubs nor gratings, and no means of drying linen. It is light, but wants a louvre in the roof for ventilation.

The water supply is stated to be sufficient. It is partly caught from the roofs, and partly derived from five pumps within the enclosure.

There are two cook-houses, which require additional light through the roof. They have two recently constructed iron ovens, not ventilated for roasting as they ought to be.

The privies are of the ordinary raised construction in use in Irish barracks. They empty into a cesspit, in a small yard at the back, close to the barrack store, and are stated to be very offensive at times. These privies should be converted into water latrines on Macfarlane's principle, with divisions of seats, half-doors, adequate light and ventilation, and the contents should either be removed daily by carts on the principle adopted at the Glasgow barracks by Macfarlane (the drainage from the ablution rooms, wash-house, &c., being allowed to flow off with the surface drainage after being filtered), or, if possible, arrangements should be made to apply the whole of the barrack drainage to the grass land at least 500 feet from any inhabited building.

The ashpits are uncovered and too deep. They should be raised a little above the level, paved, drained, and covered. This barrack has no day room, cleaning room, nor drill shed. There are no married quarters, and married people sleep in barrack rooms occupied by single men.

*The following are the Sanitary Improvements required for Naas Barrack:—*

1. Reduction of the number of men per room from 16 to 10.

2. Ventilating all the barrack rooms and school-room, by closing up one of the fire-places and converting its chimney flue into a ventilating shaft in the manner described, providing two inlets for fresh air close to the ceiling of each room. Remodelling the fire-grates to warm part of the air admitted. Library to have a shaft, inlets, and remodelled grate. Ventilating the stairs by a shaft through the roof and perforated glass panes in the windows. Ventilating the non-commissioned officers' rooms by Arnott's valves. Ventilating the canteen tap-room and non-commissioned officers' tap-room by Arnott's valves. Ventilating the guard house by a shaft and remodelled grate.

3. Ablution room to be provided with bead to the table, pegs, and forms. Two baths with water laid on to be provided.

4. Women's wash-house to have fixed tubs, with water laid on, gratings for the feet, and means of drying linen. Wash-house to be ventilated through the roof.

5. Cook-houses to have additional light through the roof. The ovens to be ventilated.

6. Privies to be reconstructed as water latrines on Macfarlane's principle, and their contents flushed daily into a cart and removed, or drained to an outlet for irrigation as suggested. The buildings to be properly lighted and ventilated. Provost privy to be converted into a water latrine. All cesspits within the barrack enclosure to be filled up.

7. Ashpits to be raised above the level, paved, drained, and covered.

*Naas Barrack Hospital.*

The hospital is two stories high, and is entered by a central passage and staircase. On the ground floor there is a ward on one side of the entrance, and on the other side are the serjeants' room and kitchen. In an outbuilding in the yard there is an itch ward, with the orderlies' room above it. In the projection on the half landing are the surgery and pack store, and upstairs are two wards. The three wards in the main building are all of the same size, namely, 28 feet long, 18 feet broad, and 11 feet high. They go through and through the building, and have two windows on each of the opposite sides, and a fire-place at each end.

The total accommodation is for 31 sick, with only 554 cubic feet per bed. The itch ward is only 9 feet long, 7 feet broad, and 9 feet high, and contains 561 cubic feet. The following table shows the accommodation in the wards:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| No. 1 - | 10 | 5 | 5 |
| „ 2 - | 10 | 5 | 5 |
| „ 3 - | 10 | 5 | 5 |
| Itch - | 1 | — | 1 |
| Total - | 31 | 15 | 16 |

There is space in the three wards for 15 beds, at 1,100 cubic feet per bed.

None of the wards are ventilated. This defect might easily be remedied as follows:—

One fire-place in each ward should be closed, and the chimney converted into a foul-air shaft, by making an opening into it near the ceiling of double the sectional area of the flue. The other grate should be remodelled to warm part of the air admitted. Two inlets for fresh air, one on each side, should be made between the windows close to the ceiling.

The kitchen requires an oven or a proper cooking range, and being under a ward it should be ventilated by a shaft 9 inches square carried from the ceiling to above the roof. The staircase requires ventilation by a shaft 9 inches square carried up from the ceiling through the roof. Perforated panes should also be placed in the windows.

There is neither water-closet, bath, nor ablution room. There is, however, abundance of space where these indispensable parts of a hospital might be placed, and accommodation might be found for them either by erecting new buildings or by some re-arrangement of the existing buildings with additions.

The orderlies' room has no fire-place, and the present surgery, where all inspections of recruits, of sick, and of prisoners are made, medicines compounded, and books and medicine chests kept, is only 15 feet long by 6½ feet wide. There is besides no provision store and no bedding store, nor is there any place where hospital bandages, &c. can be washed.

There is a privy in the back yard over a cesspit. The privy ought to be drained and made into a water latrine, and the cesspit abolished.

The adjoining ashpit ought to be removed entirely, and a box provided for receiving the hospital refuse, which should be discharged daily into the barrack ashpit.

There is no enclosure in front of the building, and the back yard is too small and confined to be a suitable place of exercise for convalescents.

*The following are the Sanitary Improvements required for Naas Hospital:—*

1. Removing one-half of the beds out of the wards.
2. Ventilating the wards by converting one of the chimney flues into a foul air-shaft, providing two inlets for fresh air close to the ceiling on opposite sides of each ward, and remodelling the ward fire-grates; ventilating the staircase by a shaft and perforated panes.
3. Kitchen to be provided with an oven or a proper cooking range, and to have a shaft carried from the ceiling to above the roof.
4. A water-closet to be provided. The privy in the yard to be drained and converted into a water latrine, and the cesspit and ashpit to be abolished.
5. A bath and ablution room to be provided, and also a bath and a Macfarlane ablution table with hot and cold water laid on.

The other deficiencies should at the same time be supplied.

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# BELFAST DISTRICT.

Sir,

In conformity with our instructions, we have examined into the sanitary condition of the following barracks and hospitals in Belfast district:—

| | |
|---|---|
| I. Belfast - - | 1. Infantry. |
| | 2. Artillery. |
| | 3. Recruiting. |
| II. Londonderry - | Infantry. |
| III. Enniskillen - | 1. Main barrack. |
| | 2. Castle. |
| | 3. Redoubt. |
| IV. Newry - - | Infantry. |
| V. Dundalk - - | Cavalry. |

And we have now the honour to report the result as follows:—

## I. BELFAST BARRACKS.

There are three barracks within the town of Belfast, one for infantry, another for artillery, and a third small barrack is used for receiving recruits.

### 1. Infantry Barracks.

These barracks are situated at the north end of the town, on ground a little elevated above the general town level. The area within the enclosure is 8a. 2r. 23p. in extent. The subsoil is a hard clay, and the surface slopes considerably from the upper end, where part of the barrack accommodation is situated, towards the high road which skirts the lower boundary wall. The situation, although not in the country, is tolerably open; but there is complaint of the nuisance and smoke arising from manufactories in the vicinity. There are houses belonging to the town on the south and east sides of the boundary; on the west side the site is open, and on the north side is placed the Royal Artillery Barrack.

There are ample natural facilities for drainage, and the position ought, on the whole, to be a healthy one.

The barrack-rooms are in ranges, one of which is built down the south side on the sloping ground. There is another range running at right angles to this along the upper end of the ground, and there are 17 soldiers' huts built in rows on part of the open ground at the north end.

The permanent buildings are of brick, and were constructed about the year 1797. The huts are of wood, and were constructed in 1854.

The rooms in the permanent barracks are in eight houses, and enter right and left out of central passages and staircases; they are in three flats, with two rooms, and a serjeant's room on each floor. They are all of one size, namely, 34 feet long, 22 feet 6 inches broad, and 11 feet 6 inches high, and they have regulation space for 20 men each, with 440 cubic feet per man. The following table gives the total accommodation in each house, both as it exists at present, and what it would be at 600 cubic feet per man:—

| Houses and Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Number of Men which ought to be placed in each Room. |
|---|---|---|---|---|
| A, 2 rooms | 40 | 30 | 10 | 15 |
| B, 6 „ | 120 | 90 | 30 | 15 |
| C, 6 „ | 120 | 90 | 30 | 15 |
| D, 5 „ | 100 | 75 | 25 | 15 |
| E, 5 „ | 100 | 75 | 25 | 15 |
| F, 6 „ | 120 | 90 | 30 | 15 |
| G, 6 „ | 120 | 90 | 30 | 15 |
| H, 6 „ | 120 | 90 | 30 | 15 |
| Total 42 | 840 | 630 | 210 | — |

By reducing the number of men per room from 20 to 15 men per room, the space per man will be raised from 440 to 586 cubic feet, which is a close enough approximation to the amount required.

There is a considerable degree of over crowding in the huts. Each hut is 38 feet long, 20 feet 3 inches broad, and 8 feet high, and has regulation space for 25 men at only 246 cubic feet per man. At 400 cubic feet per man, which is the minimum space that ought to be allowed, each hut would hold 15 men. The following table shows what would be the deficiency

in accommodation were this re-allotment carried out :—

| Huts. | Total present Regulation Number of Men. | Total Number at 400 Cubic Feet per Man. | Deficiency in Accommodation in Men. |
|---|---|---|---|
| 17 | 425 | 255 | 170 |

The total present accommodation in these barracks, compared with what it would be with the necessary increase of cubic space, would stand as follows :—

| — | Present Accommodation in Men. | Proposed Accommodation in Men. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Barracks | 840 | 630 | 210 |
| Huts - | 425 | 255 | 170 |
| | 1,265 | 885 | 380 |

Belfast infantry barracks and huts have thus space for 885 men, and no more.

Each room in the permanent barracks has four windows, two front and two back. The two former are 6 feet high by 3 feet 6 inches wide, but the two latter are only 3 feet square. The rooms have the appearance of not being well lighted, and it would improve them very much were it practicable to lower the back windows so as to double their area. There is a serjeant's berth in the corner of each room interfering with the ventilation.

The huts have four small windows 2 feet 4 inches high by 3 feet 5 inches wide. The window space is too small for the cubic contents.

Each barrack-room has two inlets for fresh air near the ceiling. They have sliding iron covers moved by ropes over pulleys, but there are no foul-air shafts. The inlets besides require protection by means of a louvre to throw the current up to the ceiling. An outlet-shaft should be carried from one corner of the ceiling to above the roof, and the grates should be remodelled to warm part of the air admitted.

Each staircase should be ventilated by a louvre through the roof, and by perforated glass panes in the windows.

The serjeants' rooms should also be ventilated by Arnott's valves in the chimnies.

The exterior of the barracks is lighted with gas, but the interior with candles. It would be a great improvement to introduce a gas-burner into each barrack-room. There is no day-room.

There is a chapel school of the usual form. It is defectively ventilated, and requires ventilators in the ridge over the gables, and openings for admitting fresh air at the stoves.

A small room is appropriated as a library and reading-room. It is inadequate for the purpose. It has gas, but is not ventilated. A shaft should be carried up from one corner of the room to above the roof, and an inlet should be provided by remodelling the fire-grate.

There is an infant school in the same building. It has two chimnies, one of which might be converted into a ventilating shaft by closing up the fire-place, and making an opening into the flue of the chimney double its sectional area. The other grate should be remodelled to warm the air admitted. This infant school might be converted into a reading-room with great advantage, if accommodation for the school could be found elsewhere.

There are two ablution-rooms, one for the permanent barracks, the other for the huts. The first of these is in the building where the infant school and library are situated. It has gratings and pegs, but there are no beads to the table.

There are two baths, but nine baths would be required for the reduced strength shown in the preceding table.

The ablution and bath room are too far from the men's rooms.

Adjoining them is the women's wash-house, a small place without suitable means of washing or drying linen for so large a barrack. It has four boilers, but no fixed tubs, and no drying stove, or means of ironing. It is also defectively ventilated, and requires glass louvres in the windows to admit of the escape of steam. Proper fixed tubs, with water laid on, and a drying and laundry stove, should be put up ; or a larger laundry, with proper appliances, should be provided.

There are two cook-houses, one of which is a barrack-room. It is supplied with boilers and a brick oven. It requires to be ventilated by a shaft 12 inches square, carried up through the roof, and by panes of perforated glass in the windows.

Water is derived from the town water-works. It is abundant, except on certain days, when the supply is diverted to the town. Part of the roof water is also collected, and there are pumps besides.

There are two sets of latrines at these barracks, one for the permanent buildings, the other for the huts.

The former are ordinary flushed privies, the deep trough of which forms part of the drain. They are very dark, and are imperfectly constructed.

The latter are over moveable troughs, which are wheeled out on a railway and their contents removed. These privies are very offensive, and the arrangement is objectionable so near inhabited huts. Both sets of privies should be remodelled on Macfarlane's plan, with division of seats, half-doors, light, and ventilation. The barrack drainage is not in a good state, and part of it passes off by means of an iron pipe exposed above ground. This pipe has numerous holes in it, through which sewage escapes into an open pond in the barrack-master's garden, within the barrack boundary, where it stagnates and becomes offensive. There is also an open drain in front of the hospital, through which a sewer has been partially carried. This sewer should be completed, the open drain and pond filled up, and the ground levelled.

These barracks have two good drill sheds. There is also a fives' court, but the floor being asphalted is not good, and there are no side walls.

The guard-room is very dark, and requires light through the roof. It should also have a shaft and remodelled grate. The lock-up is ventilated into the guard-room. A shaft six inches square should be carried through the roof.

The barracks are deficient in several important points. There is no accommodation for married soldiers whose wives are allowed. The library accommodation is defective for so large a barrack, and librarian's quarters are required. The coals for the garrison chapel are kept in the book-room for want of a suitable store. Gas is required for the kitchen to enable breakfast and tea to be made in dark weather. The women's wash-house is too small. The distance of the huts from the cook-houses is so great that the soldier's dinners are cold before they arrive at the huts. As a whole these barracks cannot be considered as being in a very good state; but their sanitary condition might be improved if the following measures were carried out.

1. Reduction of the number of men in all the barrack-rooms and huts to the extent shown in the preceding table.

2. Completing the ventilation of the barrack-rooms by carrying a shaft from the ceiling of each room above the roof, and by providing louvres for the present inlets to throw the air towards the ceiling. Barrack-room grates to be remodelled to warm part of the air admitted. Non-commissioned officers' rooms to be ventilated by Arnott's ventilators into the chimnies. Stairs to be ventilated by louvres through the roof, and perforated glass panes in the

windows. One of the chimnies in the infants' school to be made into an outlet shaft, and the fire-grate of the other to be remodelled. Library and tailors' shop to be ventilated by shafts and remodelled grates. Chapel school to have ridge ventilation, and inlets for air near the stoves. Canteen tap-room to have more windows if possible, and a remodelled grate and outlet shaft. Guard-room to have light through the roof, and a shaft and remodelled grate. Lock-up to have a shaft through the roof.

2. The barrack-rooms, kitchens, &c., to be lighted with gas.

3. Ablution-room to have beads to the table. The number of baths to be raised to nine.

4. Present women's wash-house to be ventilated by glass louvres in the windows ; fixed tubs, with water laid on, and a drying stove to be put up, or a larger laundry with requisites to be provided.

5. Cook-house to be ventilated by a shaft 12 inches square, carried from the ceiling to above the roof.

6. Latrines to be reconstructed on Macfarlane's principle, with divisions, light, ventilation, and if practicable half-doors. Barrack drainage to be improved. Open ditch in front of the hospital to be covered over, and the small pond in the barrack-master's garden to be filled up or covered over.

7. Ash-pit to be covered ; and provision to be made for the daily removal of refuse.

### 2. Artillery Barrack.

This barrack adjoins the infantry barrack, and stands on an area of ground 2A. 1R. 33 P. in extent. It was occupied by cavalry at the time of our inspection.

The buildings are of brick, arranged in a square, and are 60 years old. The soldiers' barracks occupy two parallel ranges across the square, and the stables, &c. are on the sides and at one end of the square. The officers' quarters are at the other end.

The soldiers' rooms occupy two floors, and are detached from the stables. They are entered from a staircase and passage between two rooms. At one end of the men's rooms, on one side, is a small serjeants' room. The upstairs small room is entered through the soldiers' room ; the corresponding room downstairs is entered from the parade.

There are two fireplaces in each of the two larger rooms, and there are from four to six windows per room, according to their size.

The windows, however, are too small, and the amount of light insufficient.

The rooms are low ceiled ; the windows open at the top and bottom. In the upper rooms the ceiling follows to some extent the line of the roof.

There are eight soldiers' rooms, four in each house. They are of two sizes, and have regulation space for from 12 to 16 men each, with from 329 to 362 cubic feet per man. The following table shows the accommodation :—

| Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A, house : | | | |
| 1 | 12 | 7 | 5 |
| 2 | 12 | 7 | 5 |
| 3 | 16 | 10 | 6 |
| 4 | 12 | 7 | 5 |
| B, house : | | | |
| 1 | 12 | 7 | 5 |
| 2 | 12 | 7 | 5 |
| 3 | 16 | 10 | 6 |
| 4 | 12 | 7 | 5 |
| Total - | 104 | 62 | 42 |

These rooms will barely accommodate 62 men ; it would be better to remove an additional man from each room. The numbers per room given in the third column should, however, on no account be exceeded.

In order to improve the light and ventilation, two additional windows should be made in the back wall of each of the rooms, and as each room has two fireplaces, one of them should be closed up, and the chimney converted into a shaft by making an opening near the ceiling of double the sectional area of the chimney. The grate in the other fireplace should be remodelled, to warm part of the air admitted during winter. Two inlets from the outer air should be provided close to the ceiling of each room.

The serjeant's quarters require Arnott's ventilators. The serjeant-major's quarter also requires an Arnott's valve.

The ventilation of the interior of the barrack would be still further improved by inserting perforated panes in the upper parts of the passage windows, and by carrying a shaft nine inches square through the ceiling of the staircase.

It would be a great improvement to introduce gas into all the rooms. It can be easily done, as the barrack yard is now lighted with gas.

There is a good ablution-room at the back of one of the ranges. It has gratings to stand on, pegs, and the table is of slate and has a bead.

The bath is a wooden trough. It should be replaced by a better one, when required. There is an abundant supply of water derived from the town water-works. The privies are flushed down a steep slope into the main sewer. Water does not stand in them, but there is a trap. The plan is not a good one, and requires a large amount of water. They should be reconstructed as proper water latrines on Macfarlane's principle, with divisions of seats, half-doors, adequate light, and ventilation.

The women's wash-house is too small. It requires an outlet for the steam at the back. It is likewise too dark, and should have light by additional windows. There are gratings to stand on, and two boilers, but no fixed tubs, and no drying stove.

The stables are, in some cases, ventilated by openings in the ridge ; others have no ventilation. Some have surface drainage, and some have underground drainage. The officers' stables are very dark. There is a manure heap close to the end wall of the hospital, which should be removed. There are no litter sheds.

The cook-house has a louvre in the roof ; it requires additional light through the roof ; it has a ventilated baker's oven.

The guard-room is deficient in ventilation, and requires a remodelled grate, and a shaft four inches square carried from the ceiling through the roof.

The cells open out of the guard-room, they have not enough light or ventilation ; they are merely temporary cells, but each should be supplied with a shaft four inches square through the roof, and an inlet for air either direct or through the guard-room. The urinal for the guard-room wants paving and a screen.

The guard-room at the end of the lane leading to the artillery barracks requires a remodelled grate, shafts through the roof, and additional light either by a window or through the roof, probably a ventilated lantern skylight would be best. The cells have ventilation, and a stove in the passage.

The privy for the guard-room and cells has a cesspit behind which should be filled up, and the privies converted into water latrines and drained.

*The following is a Summary of the Sanitary Improvements required for Belfast Artillery Barracks:—*

1. Reduction of the numbers of men in each room to the extent shown in the preceding table.

2. Ventilation of the barrack-rooms by converting one of the chimney-flues into a ventilating shaft, by closing it up below and making an opening into the shaft close to the ceiling double its sectional area. Two inlets for fresh air to be provided close to the ceiling of each room. Staircases to be ventilated by shafts through the ceiling and perforated panes in the windows. Non-commissioned officers' rooms to have Arnott's ventilators into the chimnies. Barrack-rooms to have additional windows at the back.

3. Privies to be reconstructed as water latrines, with drainage, divisions of seats, half-doors, light, and ventilation ; and all cesspits to be filled up.

4. Women's wash-house to have additional light and ventilation, fixed tubs, and a drying stove.

5. Cook-house to have additional light through the roof.

6. Guard-rooms to be ventilated by shafts and remodelled grates. Cells to have shafts and inlets. One of the guard-rooms to have more light through the roof.

7. Ventilation of the stables to be improved, and the manure heap near the hospital to be removed.

*Belfast Barrack Hospital.*

This hospital is situated in a corner of the infantry barrack parade ground, and has high walls shutting it in on two sides ; it is open on the other two sides. The end of the building comes close up to the stables of the adjoining artillery barrack, while in front of it, and at a short distance, there is the large open drain and unfinished sewer already mentioned. The position is not a good one, but could be improved by completing the drainage in front, filling up the stagnant pool in the barrackmaster's garden, and preventing nuisance from the cavalry stable yard.

The hospital is three stories high, and is built of stone. It has one entrance hall, with a wide wooden staircase reaching to the top of the building.

On the lower flat are two surgeries, a clean bedding store, kitchen, scullery, bath-room, pack store, reception-room, and the serjeants' quarters. Upstairs are wards and nurses' rooms.

The accommodation consists of nine wards and 80 beds, with from 646 to 761 cubic feet per bed. The details of this are given in the following table :—

| Wards. | Total present Regulation Number of Beds. | Total Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 10 | 7 | 3 |
| 2 | 10 | 7 | 3 |
| 3 | 10 | 7 | 3 |
| 4 | 5 | 3 | 2 |
| 5 | 5 | 3 | 2 |
| 6 | 10 | 7 | 3 |
| 7 | 10 | 7 | 3 |
| 8 | 10 | 7 | 3 |
| 9 | 10 | 7 | 3 |
| Total - | 80 | 55 | 25 |

The wards cannot be divided into equal spaces of 1,200 cubic feet without a large remainder ; and in the above table we have left the extra bed in the ward instead of removing it, except in one instance, where leaving the bed would have diminished the space too much.

In all the other wards the space allotted in the third column of the table is under 1,100 cubic feet per bed.

The seven larger wards are 30 feet 4 inches long, 20 feet 4 inches broad, and 12 feet high.

The two smaller wards are of the same breadth and height, but they are shorter ; one being 16 feet, the other 13 feet 6 inches long.

The larger wards have five windows each, placed in the sides and ends. The smaller wards have, one three, the others two windows.

The larger wards have two fireplaces each, but one only is used. The smaller wards have each one fireplace.

There is some provision for ventilation by perforated plates in the ceiling ; communicating in the lower wards with the outer air, and in the upper wards with the space under the roof.

It will be necessary to improve the ventilation by providing each ward with a suitable outlet, and with inlets for fresh air. Outlets could easily be provided for the larger wards by converting one of the chimney flues into a shaft, by closing the fireplace and making an opening into the flue close to the ceiling, with an aperture double the sectional area of the flue. Each of the smaller wards would require a shaft to be carried from the ceiling above the roof. Those of the existing ventilators in the ceiling, which communicate by hollow beams directly with the external air, could be used as inlets, by removing the present covers and placing a board three or four inches below the openings in the ceiling, so arranged as to throw the current upwards. In wards not having hollow beams, it would be requisite to make inlets in the walls, one on each side.

The ward fire-grates should be remodelled to warm part of the air admitted.

In order to keep the air in the hall and stair in as pure a state as possible, we should advise a shaft, a foot square, to be carried from the top ceiling to above the roof, and perforated glass panes should at the same time be put into the stair windows.

The hospital is at present lighted with candles, although gas can be obtained. We should advise that gas be laid on, and a ventilated burner introduced into each ward.

There is an ablution-room, resembling those of the barracks, on the ground floor of the hospital.

There is no fixed bath. The bath and ablution accommodation requires to be improved. A fixed bath, with hot and cold water laid on, and properly divided off from the room, should be put up, and a hospital ablution table on Macfarlane's principle should be substituted for the present arrangement.

There is a large wash-house outside the building, but it is deficient in light and ventilation, and it has no means of drying linen. The two former deficiencies can be supplied by a skylight and louvre in the roof, and a drying stove should be provided.

There is a good kitchen, but being under the sick wards it ought to be ventilated by a shaft 9 inches square, carried from the ceiling above the roof, and it should have perforated glass panes in the windows.

There is an abundant water supply from the same source as that which supplies the barracks.

There are two water-closets out of the landings within the hospital, and a privy in the back yard. The water-closets were not in proper order when we inspected the hospital, for they were offensive. This defect should be remedied. The privy in the yard is of the usual ladder construction, and has means of flushing. We would recommend that it be reconstructed on Macfarlane's principle, so that water may always stand in it. The building is dark, and requires a window or skylight.

There is an ash-pit in the yard much too close to the building. It ought to be removed ; and the hospital refuse should be collected and taken away daily.

The pack store is too small and has no rack. The pantry is also too small.

There is no accommodation for the sick of soldiers' families. The medical officer states that it would be a great improvement and general benefit if a ward for the purpose were built, or even if a hut were so appropriated.

As a whole this hospital is of better construction than most other regimental hospitals, but it is too small for the strength in barracks.

*The following are the Sanitary Improvements required :—*

1. Reduction of the number of beds per ward to the extent specified.

2. Ventilation of all the wards by shafts, inlets, and remodelled grates, as described. Ventilation of the staircase by a shaft and perforated glass panes.

3. Gas to be laid on over the hospital, and a ventilated burner to be introduced into each ward.

4. Ablution-room to have a proper ablution table, and a fixed bath with hot and cold water laid on.

5. Wash-house to be lighted and ventilated through the roof, and to have a drying stove put up.

6. Kitchen to be ventilated by a shaft and perforated glass panes.

7, Water-closets to be examined and improved. Privy in the yard to be reconstructed as a water latrine, and better lighted.

8. Ash-pit to be abolished.

9. Pack store to be provided with racks.

Lastly, the question of providing hospital accommodation for the sick of soldiers' families ought to be considered at the same time as the question of providing married quarters for the barracks.

### 3. May Street Recruiting Barrack.

This barrack consists of two ranges of buildings, one on each side of a long narrow court closed at the ends. The structure is exactly that of the usual run of unhealthy courts in the worst parts of towns, with this difference, that such courts are usually open to the street at one end, while in this barrack, with the exception of a narrow entrance, the court is closed at both ends. At one end of the court are situated an open privy, and also an ash-pit, which receives the roof water as well as the barrack refuse. Considered with reference to its construction, we can only express surprise that the idea of congregating a large number of men together in such a place was ever entertained.

The accommodation for recruits consists of two long 25-men rooms, one above the other, and small rooms at the ends. These rooms are in a long building which was formerly a store or factory. Opposite this building there are quarters, newly built, for the barrack-serjeant and for serjeants. At the street end there is a large store, which if removed would at all events permit of some circulation of air in the court, and at the end opposite the store are the kitchen, lavatory, privy, and ash-pit.

The sanitary arrangements within the men's building are as defective as those without. The lower rooms are flagged and not boarded, and there are no fireplaces. There appear to have been two originally to each long room, but they have been built up, and stoves are placed down the centre instead. No means of ventilation have been provided, and such means as formerly existed have been closed. These rooms have no thorough ventilation, as there are windows only into the court. The small end-rooms have windows to the outside. Except these end-room windows none of the others open.

Like the barrack-rooms, the serjeants' quarters have no thorough ventilation, as they have windows only into the narrow court-yard.

As it is our duty to do the best we can in improving this building, we would advise (if it be practicable) that the buildings next the street be removed, so as to throw the court open in its entire width. They might be replaced by a railing ; but if these buildings form a necessary part of the barrack, they cannot of course be dispensed with.

We should next advise the removal of the ash-pit. This is indispensable. Means must be provided for collecting and removing the refuse daily.

The cesspit must also be filled up, and the privies reconstructed as water latrines, on Macfarlane's or some other similar principle. In their present state, these privies are incompatible with the occupation of the buildings by troops.

The barrack-rooms must be thoroughly ventilated by shafts carried from the ceiling of each room above the roof. Two shafts would be required for each of the larger rooms, and one for each of the small rooms. The disused chimney-flues in the long rooms would answer the purpose of shafts by making an opening into each close to the ceiling double the sectional area of the flue. Each long room should have five inlets for air along their length, placed close to the ceiling, and each small room one inlet. All the windows should be made to open.

The lower room should be boarded. All the serjeants' quarters should have Arnott's ventilators in the chimnies.

The cook-house has an oven. There is an ablution-room, with a wooden table and gratings, but there is no water laid on, and no bath. A bath is indispensable in a barrack for recruits.

The rooms, though not occupied when we were there, appeared to have too little space for the number of bedsteads. But, on the other hand, recruits are not long detained in such barracks, and are less exposed to the evils of overcrowding than they would be in regimental barracks. Their numbers also are constantly varying. But taking into account the other defects in this barrack, we consider that 600 cubic feet per man should as a rule be allowed.

The best thing to do with May Street barrack would be to give it up ; but as it is not possible perhaps to do this, every precaution should be taken to make it healthy ; *with this view we would recommend :—*

1. Removing the front buildings, to throw the court open (if practicable).

2. Ventilating all the rooms by shafts and inlets, and making all the windows to open ; ventilating the serjeant's quarters by Arnott's ventilators.

3. Boarding the floor of the lower room.

4. Removing the ash-pit and cess-pit, and reconstructing the privies as water latrines.

5. Providing a bath, with water laid on.

6. Allotting as a rule as nearly as may be 600 cubic feet of space for each recruit.

## II. LONDONDERRY INFANTRY BARRACK.

This barrack is situated on an elevated position on the slope of a hill about 350 feet from the Foyle, on the side opposite Londonderry.

It stands within an area of 8A. 1R. $16\frac{3}{4}$P., on a subsoil of yellow clay, with a good slope for surface drainage, and ample fall to the outlet. The buildings are of stone, and were completed and occupied in 1843. They consist of one large block of men's rooms, placed on the higher end of the ground, and together with a range of huts they bound the parade ground on that end. The officers' quarters are at the end of the men's block.

At right angles to this block on one side is the hospital, opposite which are the barrack stores, guard-room, cells, &c. ; and opposite the main block of buildings are barrack huts, bounding the parade ground at the lower end.

Behind the men's rooms are two ranges of offices. The one nearest the rooms contains the kitchens, ablution-rooms, wash-houses, &c., behind which are the privies, ash-pit, &c.

The rooms are in three stories, and are reached by large well staircases, out of which they enter right

and left. The rooms are 36 feet long, 25 feet wide, and 10 and 11 feet high, with two windows on each of the opposite sides. These windows are at a considerable distance from each other; the amount of window space is small for the cubic contents, and the rooms look gloomy.

There are in all 14 barrack-rooms, and 12 men's huts, and the total accommodation is for 583 non-commissioned officers and men, with from 450 to 521 cubic feet per man in the barrack-rooms, and 250 cubic feet per man in the huts.

The following table shows the accommodation in the barrack-rooms :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Number of Men to be placed in each Room, including Non-commissioned Officers. |
|---|---|---|---|---|
| 4 | 80 | 68 | 12 | 17 |
| 2 | 40 | 30 | 10 | 15 |
| 5 | 95 | 75 | 20 | 15 |
| 3 | 57 | 45 | 12 | 15 |
| 14 | 272 | 218 | 54 | — |

There is space in these rooms for 218 men at as near as may be 600 cubic feet per man. There is a serjeant's bunk in each of the last eight rooms in the table, and the serjeant has been counted as one man in the accommodation. To diminish the crowding, three beds should be removed out of every 20-men room, and four beds out of every 19-men room.

The huts are of the usual construction. They are 38 feet by 20, and 8 feet 3 inches high. The following is the accommodation in them :—

| Huts. | Total present Accommodation. | Total Accommodation at 400 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 12 | 300 | 180 | 120 |

These huts should accommodate no more than 15 men in each.

The total accommodation in this barrack with sufficient cubic space stands as follows :—

| | Men. |
|---|---|
| Barrack-rooms - - - - | 218 |
| Huts - - - - - | 180 |
| Total - - - - | 398 |

The total present accommodation is for 572, including eight non-commissioned officers in the barrack-room bunks, while there is room for 398, showing a deficiency of space for 174 men, or about 30 per cent.

The barrack-rooms have beams in the ceilings for ventilation, running from front to back of the buildings, and communicating with the rooms by apertures in the ceilings. There are no outlet shafts, and the chimney-flues are so constructed that it is hardly possible to warm the rooms on account of the great loss of heat. Improvements in warming and ventilating must therefore go together in this instance. For the latter purpose we would propose to carry a shaft from the corner of the ceiling of each room to above the roof, and to convert the present beams into inlets by removing the sliding covers and placing louvres instead, so arranged as to throw the inflowing current of air up to the ceiling. All the fire-grates should at the same time be remodelled to warm part of the air admitted to the rooms.

There are five non-commissioned officers' rooms, each of which should have an Arnott's silk flap ventilator in the chimney.

It would still further improve the ventilation of the whole building to place panes of perforated glass in the stair and passage windows.

The huts require more ventilation at the ridge.

The rooms are lighted with candles, although there is gas laid on within the barrack enclosure. Gas-burners should be introduced into each room.

Two good barrack-rooms have been appropriated for a school-room and library. They have gas laid on. These rooms require to be ventilated and warmed in the same way as the barrack-rooms.

Behind the main building is the ablution-room for the barracks. It has a wooden table with a bead, a grating, and water laid on. There are no pegs. There is one bath, but it requires a grating and a form. Four baths would be necessary for the reduced strength shown in the preceding table.

The women's wash-house has no proper fittings up. It requires fixed tubs, water laid on, a drying and laundry stove, gratings to stand on, and more ventilation and light through the roof.

There are two good cook-houses with boilers; one of them has a brick oven, ventilated, and capable of roasting meat for 400 men. It would improve these cook-houses to put skylights in the roof.

The adjacent ash-pit is too large, and in a very foul condition; it should be reduced in size; the bottom should be raised above the level of the ground, paved and drained; it should be covered, and provided with a Macfarlane's hopper.

Water is derived from wells, and the supply is stated to be sufficient. There are tanks for collecting the roof water capable of holding 48,703 gallons.

There is no drainage except surface drainage, and superficial drains for removing water from ablution-rooms, &c. These drains are stated to be all trapped; but from some defect in them they are stated to be a source of nuisance to the barrack. This defect should be remedied while the privy drainage is being carried out.

The privies are of the usual construction, and are all placed over cesspits. They were in a very noxious condition.

They should all be reconstructed as water latrines, on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation; they should be supplied with water, and drained to the river, in regard to which, it is supposed, there would be no difficulty.

The privies belonging to the officers' quarters should be drained, and converted into waterclosets.

Ventilation is required for the canteen tap-room by an Arnott's ventilator, and perforated glass panes in the windows.

The guard-room requires a remodelled grate, and a ventilating louvre through the roof. The adjoining privy and urinal are dark and offensive; the cesspit should be abolished; the privy should be converted into a water latrine, drained, and lighted through the roof.

This barrack is deficient in the following accommodation :—

There is no day-room, drill-shed, nor cleaning-room; there are no married quarters except in the men's rooms. The barrack store is complained of as too small.

*The Sanitary Improvements required are as follow :—*

1. Reduction of the numbers of men in the rooms and huts to the extent stated.

2. Ventilation of the barrack-rooms by providing shafts, inlets, and remodelled grates; ventilation of the school-room, library, and serjeants' mess in a similar manner; ventilation of the non-commissioned officers' rooms by Arnott's ventilator in the chimney; ventilation of the passages and stairs by perforated

glass panes; ventilation of the guard-room by a shaft through the roof, and a remodelled grate; additional ventilation for the huts through the ridge.

3. Gas-burners to be introduced into the barrack-rooms.

4. Pegs to be provided for the ablution-room. Three additional baths with gratings and forms to be provided.

5. Women's wash-house to have fixed tubs with water laid on, a drying and laundry stove, gratings to stand on, and more light and ventilation through the roof.

6. Cook-houses to have skylights in the roofs.

7. Ash-pits to be reduced in size; the bottom to be raised above the level of the ground, and to be paved and drained; to be covered, and provided with a hopper.

8. All the privies to be reconstructed as water latrines, with drainage and water supply. To have divisions of seats, half-doors, light, and ventilation; and all cesspits within the barrack enclosure to be abolished. Officers' privies to be converted into water-closets.

### Londonderry Barrack Hospital.

This hospital is situated on one side of the parade ground. It has a good yard behind, but there is no enclosure separating it from the parade ground in front.

The building is three stories high, but the upper story is unfinished, and at present there are no means of access to it.

In the middle of the building there is a passage and staircase, with a short corridor from it on each flat, giving access to the wards and offices. On the ground-floor are situated the kitchen, serjeants' room, surgery, and a store-room. On the floor above are four wards, two at the ends of the corridors, and two entering from the side of the corridor. There is regulation space in these wards for 30 beds, with from 631 to 840 cubic feet per bed. The following table shows the accommodation in each ward:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 7 | 4 | 3 |
| 2 | 8 | 6 | 2 |
| 3 | 8 | 6 | 2 |
| 4 | 7 | 4 | 3 |
| Total | 30 | 20 | 10 |

There is space for 20 beds in these four wards at about 1,100 cubic feet per bed, and we would propose to fix 20 beds as the maximum number which they ought to contain.

There is a detached ward in the yard which would hold five beds, used for itch cases; its occupation is very variable.

All the wards are 12 feet high; the end wards are 28 feet by 20 feet, and the wards entering from the corridor are 23 by 16 feet. The end wards have four windows placed on two sides; the others have two windows on one side and the door from the corridor opposite. There is no accommodation for orderlies, except among the sick.

There is an air beam in the ceilings of each ward, but no proper outlet for foul air. Ventilation should be effected in the same manner as recommended for the barrack-rooms, namely, a shaft should be carried from the corner of each ward to above the roof. The air beam should be converted into an inlet by placing a louvred cover under the openings in the ceiling, so disposed as to throw the inflowing current of air towards the ceiling, and all the ward grates should be remodelled to warm part of the air admitted. Panes of perforated glass should also be inserted into the corridor windows.

The wards are lighted by candles. A ventilated gas-burner should be introduced into each ward.

There is neither ablution-room nor bath-room. The only accommodation of the kind is in the hospital wash-house, where there are two slipper baths, a shower bath, and a boiler.

An outbuilding connected with the hospital, and intended for water-closets, was being erected while we were there. This should be extended to accommodate a fixed bath and a Macfarlane's ablution table, with hot and cold water laid on.

The kitchen appears to be sufficiently supplied with means of cooking diets. It should be ventilated through the roof, and have perforated glass panes in the windows.

The building already mentioned is intended for two water-closets, but besides these there is a privy over a cesspit in the back yard; this cesspit should be abolished, and the privy drained and converted into a water-closet.

In the same yard there is an ash-pit much too close to the hospital. It ought to be removed entirely, and the hospital refuse ought to be taken away daily.

This hospital is too small for the strength in barracks, but it admits of sufficient extension by merely carrying the staircase to the upper floor, and ventilating and warming the wards, in the same manner as already recommended for the others.

*The Sanitary Improvements required for the Londonderry Hospital are as follow:—*

1. Reduction of the number of beds in each ward to the extent shown in the table, and appropriating the unfinished upper flat for sick.

2. Ventilating and warming all the wards by shafts, inlets made out of the hollow beams, and re-modelled grates. Ventilating the kitchen by a shaft and perforated panes, and the passages by perforated panes.

3. Introducing gas into the wards.

4. Providing an ablution and bath room with a fixed bath, a Macfarlane's ablution table, and hot and cold water laid on.

5. Abolishing the cesspit in the yard, and converting the privy into a water-closet. Hospital ash-pit to be removed.

## III. ENNISKILLEN BARRACKS.

There are three barracks at this station, namely, the *Main barrack* and *Castle barrack* at the north end of the town, and a single block of barracks in *a redoubt* on the opposite side of Lough Erne.

### 1. The Main Barrack.

This barrack is situated on the banks of Lough Erne, at the bottom of a steep street leading down from the town. It has the water of the lough on two sides of it, but on the other sides there is a neighbourhood of filthy houses. During the rainy season the water overflows part of the barrack ground. Within the barrack boundary there is an area of 4A. 2R. 35P. The subsoil is gravelly, resting on limestone. The site is by no means a good one, so far as elevation is concerned, but it is open, and comparatively airy.

The buildings are of stone, and were erected about the year 1786. They consist of a centre and two wings, containing men's rooms, with officers' quarters at the end. There are also several men's rooms which have been constructed out of disused stables. The rooms in the main building are in two houses, three stories high. They are reached by central passages and stone staircases, out of which the rooms enter right and left, four on each flat. The rooms are back to back, with openings through the partition walls. They are lighted by two small windows on one side, all of which do not open at top. Half of the rooms are 10 feet 2 inches high, and the remainder are 9 feet 2 inches high. They vary from 21 to

about 24 feet in length, and from 15 feet 3 inches to 15 feet 10 inches in breadth. The ceilings of two flats of the rooms are boarded. There are 27 rooms, with regulation accommodation for 268 men, the details of which are as follow :—

| Rooms. | Total present Regulation Number of Men. | Total Number of Men at 600Cubic Feet each. | Deficiency of Accommodation in Men. | Number of Men to be placed in each Room. |
|---|---|---|---|---|
| 2 | 18 | 12 | 6 | 6 |
| 2 | 20 | 12 | 8 | 6 |
| 4 | 40 | 20 | 20 | 5 |
| 4 | 40 | 24 | 16 | 6 |
| 4 | 40 | 24 | 16 | 6 |
| 3 | 30 | 18 | 12 | 6 |
| 4 | 40 | 24 | 16 | 6 |
| 4 | 40 | 24 | 16 | 6 |
| Total 27 | 268 | 158 | 110 | |

This table shows the rooms in the main building to be very much overcrowded. The beds are at present only 20 inches from side to side, and 20 inches from foot to foot. The last column in the table shows what ought to be the number of men in each room at an average of less than 600 cubic feet per man, and these numbers represent the maximum which can be safely put into them.

No part of the building is ventilated. To remove this defect, we would recommend that all the windows be made to open at top ; that each stair be ventilated by a louvred shaft carried up through the roof, and by perforated glass panes in the windows ; and that each barrack-room have a shaft carried from the corner of the ceiling to above the roof, and one inlet for fresh air close to the ceiling between the windows.

The fire-grates are large, and of an old pattern, intended to burn turf. They waste much heat, and ought to be remodelled, so as to warm part of the air admitted to the rooms.

Besides these rooms, four stables have been converted into 18-men rooms, and two into 16-men rooms, affording additional regulation space for 104 men. They are over-crowded, and require ventilation by shafts through the ridge, and inlets at the eaves. Several parts of them are dark, and require additional window space. The men in these rooms should have, as nearly as may be, 600 cubic feet allotted to each.

Close to one of these stable-rooms is an ash-pit, which ought to be removed forthwith to another part of the enclosure. There is plenty of space for it at a safe distance from the men's rooms.

The barracks are lighted with gas.

There are two school-rooms, one for non-commissioned officers and privates, the other is an infant school. The former has two fireplaces, one of which might be closed, and the flue adapted for a ventilating shaft by making an opening into it close to the ceiling. Inlets for air should also be provided, and the remaining fire-grate should be remodelled.

The infants' school is very small, and might be ventilated by an Arnott's valve in the chimney.

There is one ablution-room situated at a considerable distance from the men's rooms. It has a wooden table, gratings, and water laid on from a cistern, but there are no pegs nor forms. There is no bath, and no ventilation.

There are two women's wash-houses, which require the usual improvements of fixed tubs with water laid on, gratings, and means of drying and getting up linen.

One of the cook-houses, of which there are two, requires ventilation through the roof. A brick oven was about to be erected in one of them at the time of our inspection.

The armourers' shop has not sufficient light, and requires the windows to be enlarged.

Water is obtained from two pumps, and is used for washing, &c. Drinking water has to be carried by a fatigue party from the Castle springs, the yield of which is of better quality. For all other purposes the lake, which is close at hand, affords an inexhaustible supply.

The surface drainage behind the barrack buildings is not good, on account of cobble stones being used for paving. These should be replaced by square setts. The privies are of the common defective construction, and overhang the lough ; but as they give rise to nuisance, they should be converted into water latrines, on Macfarlane's principle, the water being supplied by a pump. The building should be lighted, ventilated, and provided with divisions of seats and half doors, and drained into the lake.

Both the canteen tap and non-commissioned officers' room require Arnott's valves in the chimneys.

The guard-room has a flagged floor ; it is not ventilated, and requires a louvre in the roof and a remodelled grate.

There is no exercising ground belonging to the provost establishment ; the cells are warmed and ventilated, but the amount of air admitted into the passage does not appear to be sufficient.

This barrack has no day-room nor drill-shed, and no accommodation for married non-commissioned officers nor soldiers, and 19 women are sometimes accommodated in men's rooms. The barrack-rooms are so narrow that the tables and forms have to be removed before the beds are made down. There is no serjeants' mess.

*The following are the Sanitary Improvements required in the Main Barracks :—*

1. Reduction of the numbers of men in all the barrack-rooms of the main building, and in the stable barrack-rooms, so as to give, as nearly as may be, 600 cubic feet per man.

2. Ventilation of the barrack-rooms in the main building by shafts, inlets, and remodelled grates, and by making all the windows to open at top. Ventilation of the stairs by louvres through the roof, and perforated glass panes in the windows. Ventilation of the stable barrack-rooms by louvres in the ridge, and inlets at the eaves ; additional light to be given to these rooms. Ventilation of the school-room by converting one of the chimney flues into an outlet foul-air shaft ; providing inlets for fresh air, and remodelling the other fire-grates. Ventilation of the infant's school-room by Arnott's valves. Guard-room to have a louvre in the roof, and a remodelled grate ; passage to the cells to have more air admitted to it.

Tap-room and non-commissioned officers' room in the canteen to have Arnott's valves in the chimneys.

3. Ablution-room to have ventilation through the roof and two baths.

4. Women's wash-houses to have fixed tubs, water, and means of drying and getting up linen.

5. One of the cook-houses to have roof ventilation.

6. Armourer's shop to have the windows enlarged.

7. Privies to be reconstructed as water latrines, on Macfarlane's principle; to be supplied with water, and drained into the lake ; also to have divisions, half-doors, light, and ventilation. Ash-pit to be removed to another part of the enclosure.

### 2. The Castle Barrack.

This barrack is situated within the old castle boundaries, and occupies an area of ground of 1a. 2r. 25p. in extent. It was erected about the year 1818. Its local position is similar to that of the main barrack. It is close to the water of the lake, and so near its level that the water occasionally overflows part of the parade ground. The area of ground is irregular in form. On one side is a two-story building used as officers' quarters, ordnance stores, &c. Along the side next the lough is a range of gun sheds, over which are men's rooms. Adjoining this range are some old buildings forming part of the castle, in which there are also men's rooms. The hospital

occupies the middle of the enclosure. There are seven barrack-rooms, with accommodation for 84 men at from 339 to 826 cubic feet per man. The following table shows what the accommodation is in each room :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 20 | 12 | 8 |
| 1 | 23 | 14 | 9 |
| 1 | 20 | 13 | 7 |
| 1 | 3 | 3 | — |
| 1 | 6 | 4 | 2 |
| 1 | 6 | 5 | 1 |
| 1 | 6 | 6 | — |
| Total 7 | 84 | 57 | 27 |

Most of the rooms are considerably overcrowded, and ought not to accommodate more than 57 men, who would have less than 600 cubic feet per man on an average.

The rooms vary from 17 feet to 53 feet in length ; from 7 to 15 feet 4 inches in breadth ; and from 9 feet 1 inch to 11 feet 2 inches in height. Those rooms over the gun sheds have a number of small windows on opposite sides. The windows towards the court-yard are the largest, and those to the outside contain only three panes of glass.

Three rooms have each two fireplaces, the others have one each. The rooms over the gun sheds are partially ventilated into the roof, but the method is not a good one. We would advise that instead of it shafts be carried from the ceiling ventilators above the roof, and that proper inlets be provided close to the eaves. All the fire-grates ought to be remodelled to warm part of the air admitted during winter.

The staircases require ventilation by perforated panes in the windows. The serjeants' rooms require ventilation by Arnott's silk flap valves.

There is a light, well ventilated ablution-room in one of the gun sheds. It has a wooden ablution table with a bead, and water laid on, but it has no pegs. There is no bath, although there is space for one.

Adjoining the ablution-room is the cook-house. It has boilers, but no oven ; and it requires ventilation by a shaft 9 inches square carried from the ceiling above the roof, and perforated glass panes. There is a small women's wash-house in one of the gun sheds ; it requires ventilation in the same manner as the cook-house. It should have fixed tubs, water laid on, and a drying stove.

The privies are directly over the lake, but they require to be improved in structure to prevent their becoming foul from filth deposited on them. They require divisions, half-doors, light, and proper roof ventilation.

The stables are rather dark. They have a very large manure pit in front ; it is quite unnecessary, and at all events it ought to be filled up above the level, paved, drained, and contracted in dimensions.

Ventilation is required for the guard-room. There is an arched roof, and perhaps the best way to supply fresh air would be to introduce an Arnott's valve into the chimney, to make an inlet at the ceiling, and to remodel the fire-grate. Two cells are ventilated into the guard-room. This should be remedied by providing another outlet for the foul air directly from the cells.

*The Sanitary Improvements required for the Castle Barrack are as follow :—*

1. Reduction of the number of men in each room to the extent stated.

2. Ventilation of the rooms by shafts, inlets, and remodelled grates. Serjeants' rooms to be ventilated by Arnott's valves in the chimneys. Stair windows to have perforated panes.

3. Ablution-room to be supplied with pegs ; and one bath, with water laid on, to be provided.

4. Cook-house to have an oven, and to be ventilated by a shaft and perforated glass panes in the windows.

5. Women's wash-house to be provided with fixed tubs, water laid on, and a drying stove ; also, to be ventilated by a shaft and perforated glass panes.

6. Privies to be improved in the respect suggested, and to have divisions of seats, half doors, light, and roof ventilation.

7. Stables to have more light, and the manure heap to be contracted in size, filled up above the level of the ground, paved, and drained.

8. Guard-room to have an Arnott's valve in the chimney, an inlet close to the ceiling, and remodelled grate. Ventilation of cells to be improved.

*Enniskillen Barrack Hospital.*

The hospital for the station is situated in the middle of the castle yard. It is a large three-story building, more like a dwelling house than a hospital.

The kitchen is on the ground floor. The wards are reached by a narrow wooden staircase. On the first floor is the surgery and one ward, and there are two wards on the floor above. Two of the wards are 10 feet high, and one is 11 feet 3 inches high. Two wards are nearly square in form, being, one 38 feet 4 inches by 34 feet 5 inches, and the other 40 feet 5 inches by 35 feet 7 inches. These proportions are ill adapted for ventilation, and the wards were very close, although unoccupied at the time we inspected them. The present regulation accommodation is for 37 beds, with from 400 to 524 cubic feet per bed, a space totally inadequate for the safe care and treatment of the sick. The following table shows the accommodation :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 1 | 14 | 6 | 8 |
| 2 | 5 | 2 | 3 |
| 3 | 18 | 6 | 12 |
| Total | 37 | 14 | 23 |

Were this building otherwise suitable for a hospital, it would hold 14 beds as a maximum number.

The present means of ventilation are deficient, and should be improved by a shaft for each ward, inlets, and remodelled grates. The stair requires ventilation by a shaft through the roof, and perforated glass panes in the windows. The kitchen should also be provided with perforated panes.

There is neither lavatory, bath, nor hospital wash-house. The kitchen is deficient in the means of cooking diets, and requires a new range with an oven. There is neither water-closet nor drainage. There is neither pack store nor bedding store.

The building is indeed deficient in many most important hospital requisites.

We have indicated the nature of the sanitary improvements required for this building, but if they were all carried out it would be still a very insufficient hospital for the station, in so far at least as the amount of accommodation is concerned. Fourteen beds, the total number it ought to contain, are not by any means enough for the barrack construction.

*Should it nevertheless be considered advisable to retain the present building as a hospital, we would recommend as follows :—*

1. That the number of beds be reduced from 37 to 14.

2. That the wards be ventilated by shafts, inlets, and remodelled grates, the staircase by a shaft and

perforated glass panes, and the kitchen by perforated panes.

3. That an ablution-room, with a table, a bath with hot and cold water laid on, be provided.

4. That a water-closet be provided, and the hospital drained.

5. That a proper cooking range be put up in the kitchen.

6. That the hospital storeage be improved.

### 3. The Redoubt Barrack.

The redoubt in which this barrack is situated occupies a lofty position on a hill overlooking Lough Erne, at a short distance from the town of Enniskillen. The area within the redoubt is very small, being only 1 R. 33¼ P. in extent. The buildings are in a single block of two stories, erected in 1827; they were intended originally for an hospital, but were subsequently appropriated as soldiers' quarters, to which latter purpose they must necessarily have been adapted at any time in case the redoubt required to be occupied by troops on an emergency. A central passage and staircase afford access to the rooms; the passage runs the lengthway of the buildings. Several small rooms, with windows on one side, open out of it right and left, and at each end is a large room the whole depth of the building. On the upper flat are two large well-lighted rooms, with three windows on each of the opposite sides, and there is a store-room off the staircase. There are in all six barrack-rooms, with accommodation on the present construction, for 63 men at from 446 to 517 cubic feet per man. The following table gives the details:—

| Rooms. | Present Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 3 (3 men each) | 9 | 6 | 3 |
| 1 - - | 14 | 11 | 3 |
| 1 - - | 20 | 18 | 2 |
| 1 - - | 20 | 18 | 2 |
| Total - 6 | 63 | 53 | 10 |

There is space for 53 men at rather less than 600 cubic feet per man.

All the rooms require ventilation by shafts, inlets, and remodelled grates.

There is no ablution nor bath room.

The kitchen has boilers, but no other means of cooking; a proper oven is required.

There is a privy and urinal close to the rampart and to the barrack-rooms; they are over a cesspit, out of which the soil is scraped into the ditch to be removed. The whole arrangement is very defective and offensive; it could be easily remedied by a Macfarlane's water latrine, which requires very little water; and a drain might be carried down to the lake, which is only about 300 yards off. Water is derived from a deep well.

As the hospital at the castle is not fit for its purpose, the best thing to do would be to convert the redoubt buildings into a hospital. The present barrack-rooms would accommodate 29 beds at about 1,100 cubic feet per bed, and six additional beds might be accommodated in three other rooms.

The present hospital in the castle, if ventilated and improved as we have recommended, would afford additional barrack accommodation.

If the hospital were removed to the redoubt, it would be necessary to find space for an ablution and bath room and for properly drained water-closets.

*We would recommend for the Redoubt Buildings as follows:—*

1. Reducing the number of beds on the construction to the extent stated above.

2. Ventilating all the rooms by shafts, inlets, and remodelled grates.

3. Providing an oven or cooking range for the kitchen.

4. Providing an ablution and bath room with one bath.

5. Reconstructing the present privies as water latrines on Macfarlane's principle, and draining them to the lake.

6. Providing a water-closet, if the building is used for a hospital.

Lastly, if it be considered unadvisable to adapt the redoubt buildings for a hospital, a new hospital should be built, as the present one in the castle is quite unfit for its purpose.

## IV.—NEWRY INFANTRY BARRACKS.

The town of Newry is situated in a hollow surrounded by hills and high ground, and at its outskirt are the buildings of an old linen hall, now appropriated as a barrack. These buildings are in eight parallel blocks or ranges. They occupy the lower end of the slope of an extensive parade ground, and they are 15 or 20 feet above the level of a canal passing the front of the barrack enclosure.

The area within the barrack enclosure is 7A. 3R. 13P. in extent. The subsoil is gravelly, and the buildings are of stone. The entrance is by a very inconvenient road along the canal from the town. The canal has no fencing, and it has been stated to us that in consequence of this want many soldiers have from time to time fallen into the canal and been drowned. There is another and a convenient entrance at the higher end of the barrack enclosure, which for some reason is disused, but which could be rendered available by providing a guard-room.

The district is said to be liable to sudden changes of weather and climate, but otherwise it ought to be healthy, so far as the topographical position of the barrack is concerned.

The blocks are arranged perpendicularly to the front boundary wall, and the barrack offices, cells, privies, canteen, cook-houses, &c., are built along the front and side boundary walls.

Each block is two stories in height, one of which is 9 feet 6 inches, and the other 9 feet 9 inches high. The rooms are all of the same breadth, nearly 14 feet 9 inches; they vary in length from 20 feet to 30 feet 6 inches, and are arranged as follows:—A corridor, 10 feet 6 inches wide and two flats high, runs from end to end of the block, and the barrack-rooms enter from it. The ground-floor corridor has windows and doors to the outer air, and the upper corridor, which is reached from the lower corridor by wooden stairs, has also windows to the outer air. Sixty-nine rooms have access from these corridors. Nineteen of these rooms have space for two men each, and the remaining rooms have regulation accommodation for from 10 to 14 men per room, with from 281 to 321 cubic feet per man. The two-men rooms give from 719 to 926 cubic feet for their occupants.

All the rooms, except these last, have the aspect of excessive overcrowding, and it was stated to us that it was necessary to remove the tables into the corridors in order to be able to turn down the beds.

The total regulation number of men in the larger rooms is 640, the details of which are given in the

following table, in contrast with the accommodation at considerably less than 600 cubic feet per man :—

| Barrack Rooms. | Total present Regulation Accommodation | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| C. | | | |
| 1 | 10 | 5 | 5 |
| 3 | 14 | 8 | 6 |
| 4 | 14 | 8 | 6 |
| 5 | 14 | 8 | 6 |
| 7 | 10 | 5 | 5 |
| 8 | 10 | 5 | 5 |
| 10 | 14 | 7 | 7 |
| 11 | 14 | 8 | 6 |
| 12 | 14 | 7 | 7 |
| 14 | 10 | 5 | 5 |
| D. | | | |
| 1 | 14 | 8 | 6 |
| 2 | 14 | 8 | 6 |
| 4 | 14 | 8 | 6 |
| 5 | 14 | 7 | 7 |
| 7 | 14 | 7 | 7 |
| 8 | 14 | 7 | 7 |
| E. | | | |
| 1 | 14 | 8 | 6 |
| 2 | 14 | 8 | 6 |
| 3 | 14 | 8 | 6 |
| 5 | 14 | 7 | 7 |
| 6 | 14 | 7 | 7 |
| 8 | 14 | 7 | 7 |
| F. | | | |
| 1 | 10 | 5 | 5 |
| 3 | 14 | 8 | 6 |
| 4 | 14 | 8 | 6 |
| 5 | 14 | 8 | 6 |
| 7 | 10 | 5 | 5 |
| 8 | 10 | 5 | 5 |
| 10 | 14 | 8 | 6 |
| 11 | 14 | 8 | 6 |
| 12 | 14 | 8 | 6 |
| 14 | 10 | 5 | 5 |
| G. | | | |
| 1 | 10 | 5 | 5 |
| 3 | 14 | 8 | 6 |
| 4 | 14 | 8 | 6 |
| 5 | 14 | 8 | 6 |
| 7 | 10 | 5 | 5 |
| 8 | 10 | 5 | 5 |
| 10 | 14 | 7 | 7 |
| 11 | 14 | 8 | 6 |
| 12 | 14 | 7 | 7 |
| 14 | 10 | 5 | 5 |
| H. | | | |
| 1 | 10 | 5 | 5 |
| 3 | 14 | 8 | 6 |
| 4 | 14 | 8 | 6 |
| 8 | 10 | 5 | 5 |
| 10 | 14 | 8 | 6 |
| 11 | 14 | 8 | 6 |
| 12 | 14 | 7 | 7 |
| 14 | 10 | 5 | 5 |
| Total | 640 | 344 | 296 |

The number 344 is the maximum number these rooms ought to contain. The 19 two-men rooms are quite sufficiently occupied as they are, and the numbers in them ought not to be increased.

The upper corridors had bedsteads in them, as if it were intended to occupy them. These bedsteads ought to be removed. A corridor is objectionable as a means of access to a number of rooms, on account of the difficulty it throws in the way of thorough ventilation; and it would certainly be a great and unnecessary risk to health to crowd men into such corridors, except under the pressure of necessity, which cannot be said to exist at present.

The means of ventilation afforded by the structure of the buildings are very deficient. The corridors have, of course, windows only on one side, and the rooms windows on one side, but the benefit of these windows is neutralized by the partition between the rooms and corridors, so that the air is stagnant in both.

Four of the rooms have loop-holes, which can be used to afford a certain extent of ventilation. Twenty rooms have openings over the doors into the corridors, and 45 rooms have no provision of any kind for ventilation.

To remedy these defects as far as possible these corridors and rooms should be separately ventilated. To relieve the upper corridor from the foul air coming from below, we would advise a large louvre to be carried through the roof from the ceiling of the upper corridor, over each staircase, and all the corridor windows should have panes of perforated glass put into the upper row in each window frame.

The rooms should be ventilated by carrying a shaft from the corner of each ceiling to above the roof, and an inlet for air of sufficient dimensions should be provided close to the ceiling, above the windows, and as nearly as may be in the middle of the length of the room.

The two-men rooms would be sufficiently ventilated by an Arnott's ventilator into the chimney.

In order to enable the rooms to have a thorough draft passed through them, it would be very advisable to make an opening with a window between each room and the corridor.

All the fire-grates require to be remodelled to warm part of the air admitted to the rooms.

Gas is laid on to the barrack, but not to the barrack-rooms. These rooms, as well as the corridor, school, library, &c., should have gas-burners introduced into them.

There is a good school-room and a library, situated in the same building with the hospital. Both rooms require shafts, inlets, and remodelled grates.

The ablution-room is at the end of a short block of buildings; it has slate ablution tables carried down the centre and along the sides of the room. The tables have wooden beads. Water is laid on from a cistern supplied by a pump within the building, and weighted taps are used, to prevent waste. There are gratings to stand on, but pegs should be provided.

An old stone horse-trough in a corner of the room is intended for a bath, for which purpose it is quite useless. A sufficient number of baths, according to the strength, should be provided.

A woman's wash-house has been made out of an old cook-house; it has seven boilers, but there are no fixed tubs, and no means of drying or getting up linen, such as have been so successfully introduced into several of the Dublin barracks. This wash-house is rather dark, and should have more light.

There are two cook-houses with boilers, and in one of these houses two ovens have been recently erected which cook for 200 men; they cost 50*l.* each, and require 80lbs. of coal to bake the dinners. These cook-houses are ventilated through the roof, but they require more light.

The only accommodation for trades is a dark shoemaker's shop, with a paved floor. The shoemaker's shop is, moreover, used as a place for cutting up the men's meat, as there is no shed for the purpose.

There is no cleaning room. The corridors are used as drill sheds in wet weather, and also for divine service when the weather does not admit of the men going to church. There is no day room.

There are no married soldiers' quarters, except soldiers' rooms, which are generally given up to married people by commanding officers.

The two-men rooms are commonly occupied by serjeants, whose mess kitchen and mess-room is under the same roof as the school-room and library

in a building at the end of the hospital. Staff-serjeants' quarters are provided in the same place.

Water is derived from four pumps within the barrack enclosure. The canal can be rendered available for any amount of water required for sanitary purposes, except cooking and drinking. The surface drainage of the barracks passes into the canal, as well as other offensive surface drainage, and it would be unadvisable to use the water for dietetic purposes.

In the proper sense of the term these barracks are not drained, and the privies are all placed over cesspits of the most noxious kind. Those belonging to the barrack-rooms are near the north-east corner of the enclosure close to the canal. The buildings are dark and without sufficient ventilation. There is an arrangement by which the soil is removed into an open pit, where it is mixed with peat charcoal and removed for manure. The whole process is most offensive, and ought to be abolished, but the difficulty is how to obtain an outlet for the drainage, for the canal cuts off the outlet at the lowest level, and it would be impossible to drain the privies into the canal.

The plan which appears most advisable in the present case is to drain all the privies on the higher levels, including those of the hospital and adjoining buidings, down to an iron tank at the north-east angle, where the soldiers' privies are, and to convert all of them, including the soldiers' privies, into water latrines, on Macfarlane's principle. The levels of the outlet should be so adjusted that a water-tight iron cart could be backed under the discharge pipe of the tank, so that its contents might be discharged into the cart and removed daily.

It would probably be better to deal with the latrines at the officers' quarters separately, on account of the position of the quarters.

The canteen tap-room requires an Arnott's silk flap ventilator into the chimney.

The cells are on one side of the parade ground, and they are ventilated and warmed in the usual way. The parade ground behind is very narrow and gloomy.

There is a bell from the cells to the provost serjeant's quarters. The guard-room is dark, and without ventilation. It requires a shaft, inlet, and remodelled grate.

*Newry Barracks require the following Sanitary Improvements to be carried out:—*

1. Reduction of the number of inmates in the barrack-rooms to the extent shown in the table.
2. Ventilation of all the corridors by louvres through the roofs and perforated panes in the windows. Ventilation of the barrack-rooms by shafts, inlets, and remodelled grates, and by openings into the corridors. Ventilation of the small two-men rooms by Arnott's valves. Library, school-room, and guard-room to have shafts, inlets, and remodelled grates. Canteen tap-room to have an Arnott's ventilator.
3. Gas to be laid on to the barrack-rooms, &c.
4. Baths, in the proportion of one bath to 100 men, to be provided.
5. Women's wash-house to be provided with fixed tubs, water laid on, and a drying and laundry stove.
6. Cook-houses and guard-house to have more light.
7. All cesspits within the barrack boundary to be abolished. All privies to be reconstructed as water latrines on Macfarlane's principle, and the outlet to be arranged so that the contents of the latrines can be discharged into an iron tank, from which the sewage matter can be removed daily in a water-tight cart.

*Newry Barrack Hospital.*

This hospital is situated at the higher end of the parade ground within an enclosure. It is a long building three stories high, part of which has been cut off for serjeants' mess, staff serjeants' quarters, library, school-room, &c., to the great detriment and overcrowding of the hospital.

In the middle of the building is a wide roomy well-staircase, extending from the ground up to the top of the building; but the utility of this internal reservoir of air, which is of great importance in all hospitals, has been neutralized by cutting off the connexion between the staircase and the wards by partitions of wood, with the intention, no doubt, of keeping the wards warm, but with the result of making these wards about the worst, as regards ventilation, we have anywhere met with.

The accommodation is arranged as follows:—On the ground floor are the serjeant's room, kitchen, pack, and provision stores. On the first floor is a surgery and three wards, two of which open the one from the other. The upper flat wards are similarly disposed. There are two small wards off the half landings. The total present regulation accommodation in these eight wards is for 62 beds, with from 405 to 519 cubic feet per bed, but only two beds have this utterly insufficient maximum space allotted to them. Such of the wards as have more windows than one have the windows placed on two sides.

The following table gives the details of the accommodation in this hospital:—

| Wards. | Total present Regulation Accommodation. | Total Accommodation at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| Itch Ward - | 2 | 1 | 1 |
| Acute - - | 10 | 4 | 6 |
| Venereal, No. 1 | 10 | 4 | 6 |
| „ „ 2 | 10 | 4 | 6 |
| Chronic Ward | 10 | 4 | 6 |
| Ophthalmic No. 1 | 10 | 4 | 6 |
| „ „ 2 | 10 | 4 | 6 |
| Total - - | 62 | 25 | 37 |

The eighth ward is in reality an inspection-room not used for sick. It has only 852 cubic feet of contents.

In not one of the wards have we allotted 1,200 cubic feet in the above table. The amount we propose to give varies from 1,000 to 1,100 feet, and notwithstanding this moderate allowance, the whole hospital will only accommodate 25 sick in place of 62. The building affords a marked instance of excessive over-crowding as well as of bad ventilation; and judging from the state of the wards when we visited them, it is a matter of surprise that sick should be received into such a place at all.

The very first improvement required is to remove 37 beds out of the building, and this should be done with as little delay as possible.

None of the wards have any proper ventilation. What is called the acute ward has two inlets made in the north gable, but it has no outlet, and it is the only ward provided with even an inlet. The whole building requires fresh air to be permitted to enter it, and with this view the first thing to be done is to remove the wooden partitions which cut the wards off from the central staircase.

If there be any objection on account of cold, it can be readily overcome by placing a Cundy's stove at the bottom of the stairs. A similar arrangement has been successfully adopted in Limerick garrison hospital. A louvre should also be placed in the ceiling of the staircase to circulate the air in it.

Each ward should be ventilated by a shaft, an inlet close to the ceiling on each of the opposite sides of the ward, and a remodelled grate to warm part of the air admitted.

The kitchen, which is under a ward, requires a ventilating shaft through the roof, and a proper oven or cooking range. The means of preparing diets are not sufficient at present.

There is neither ablution nor bath accommodation.

if we except two tin slipper baths, quite inadequate for the purpose.

The itch ward on the half-landing might be converted into a bath and ablution room ; it ought to have a Macfarlane's ablution table, with sunk basins, and water laid on, hot and cold ; and the bath should also be supplied with hot and cold water.

The only place for washing hospital clothes, &c., is the kitchen. A small wash-house, suitably furnished, should be provided.

Water is obtained from a pump in the hospital yard.

The surface drainage is conveyed away in a drain which passes beneath the hospital. This is always a dangerous direction in which to carry drainage ; it should always be carried outside hospital buildings.

There is no water-closet connected with the building ; but behind there is an open privy over a cesspit, above the level of the hospital floor, and directly under the ward windows. A similar privy and cesspit belongs to the adjoining school, serjeant's mess, &c.

These should be abolished at once ; proper water-closets should be put up for the hospital, and the drainage conveyed away, with that of the barrack, in the manner already described.

The first thing to be done with this hospital is to decide how many beds are required for the strength, and to provide them at, as nearly as may be, 1,200 cubic feet per bed. In doing this huts should be erected, or, what would be much better, the whole building under the hospital roof should be given over to the hospital, and the library, school, mess-room, quarters, &c., provided for elsewhere.

The hospital should be thoroughly cleansed, lime-washed, painted, and put in repair, all of which it very much needed when we inspected it.

*The Sanitary Improvements required are :—*

1. Reduction of the number of beds in each ward to the extent stated above.
2. Removing the partitions between the staircase and wards, ventilating the staircase through the roof, and warming it by a Cundy's or some similar stove.
3. Ventilating the wards by shafts, inlets, and remodelled grates of the usual construction.
4. Providing a range or oven for the kitchen.
5. Providing an ablution and bath room, and an ablution table, and bath with hot and cold water laid on to both.
6. Abolishing the present privy and cesspit, and providing a properly drained water-closet ; the drainage to be carried into the barrack drainage, without passing under the hospital.
7. Providing a hospital wash-house, with means of drying linen.

There is, of course, no space in which to receive the sick of soldiers' families, a deficiency which should be supplied when the hospital is extended.

## V. DUNDALK CAVALRY BARRACK.

This barrack is situated in an airy, open position to the east of the town, not far from the sea, and within about 100 yards of the quay. The site is little raised above high water mark, and has a gravelly subsoil. There are houses close to the boundary, but they do not encroach injuriously on the barrack. The total area within the enclosure is 8A. 2R. 10P. All the buildings are of stone, and are of recent construction ; they are arranged in square. The men's rooms occupy blocks on each side of the parade ground, the officers' quarters are at one end of the ground, and at the other end are the stables, arranged in blocks parallel to each other, with their ends to the parade-ground. Some temporary sheds have been placed against one wall of the existing stables, interfering with their light and ventilation.

The men's rooms, 22 in number, are on two floors, in 12 separate houses ; they are entered right and left from a central passage and staircase, lighted by windows on opposite sides. In half the barracks the staircases are of wood, in the other half of stone. The rooms have windows on both sides, except the end rooms of the blocks, which have no windows at the back. These end rooms are used for serjeants' quarters. The total construction is for 379 non-commissioned officers and men, with from 365 to 393 cubic feet per man. One 16-men room is returned to us as having 2,730 cubic feet of contents, and as affording only 170 cubic feet per man for its inmates. The following table gives the details for the men's rooms :—

| Rooms. | Total present Regulation Number of Men. | Total Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Houses : | | | |
| D, No. 2. - | 16 | 11 | 5 |
| E, „ 1. - | 16 | 11 | 5 |
| „ 2. - | 16 | 10 | 6 |
| F, „ 1. - | 16 | 11 | 5 |
| „ 3. - | 16 | 10 | 6 |
| G, „ 1. - | 16 | 11 | 5 |
| „ 2. - | 16 | 10 | 6 |
| H, „ 1. - | 16 | 11 | 5 |
| „ 2. - | 16 | 10 | 6 |
| I, „ 1. - | 16 | 11 | 5 |
| J, „ 2. - | 16 | 11 | 5 |
| „ 3. - | 16 | 10 | 6 |
| K, „ 1. - | 16 | 11 | 5 |
| „ 2. - | 16 | 10 | 6 |
| L, „ 1. - | 16 | 11 | 5 |
| „ 3. - | 16 | 10 | 6 |
| M, „ 1. - | 16 | 11 | 5 |
| „ 2. - | 16 | 10 | 6 |
| N, „ 1. - | 16 | 11 | 5 |
| „ 2. - | 16 | 10 | 6 |
| O, „ 1. - | 16 | 11 | 5 |
| „ 3. - | 16 | 5 | 11 |
| Total - - | 352 | 227 | 125 |

It will be seen, from this table, that there is space in these rooms for 227 men, instead of 352, the present number ; but in order to admit of such an extent of accommodation, it is necessary to give considerably less than 600 cubic feet per man. The numbers should, therefore, be reduced from 16 to 11, or 10 men per room, and in one case, to five men. These numbers show the maximum accommodation which should be allotted in this barrack.

Each barrack-room has four windows, two on each of the opposite sides. These windows are made to open top and bottom, but there are no other means of ventilation. To supply this defect, the rooms should be provided with shafts, inlets for air, and remodelled grates to warm part of the air admitted in winter. The staircase should also be ventilated by a louvre carried through the ceiling and roof. Arnott's ventilators should be introduced into each non-commissioned officer's room. There is gas in the barrack-rooms.

The end down-stairs rooms in each range are occupied as a cookhouse and woman's washhouse. Each of these rooms requires two shafts, 9 inches square, to be carried through the ceiling and roof, one at each corner, and perforated panes of glass in the windows to carry off the vapour, and to prevent its passing into the sleeping-rooms above. The position of both cook-houses and wash-houses is very objectionable, and provision should be made for their removal to proper detached buildings as soon as possible. The rooms are required for non-commissioned officers' quarters, and are not at all adapted for their present purpose.

The cook-houses have boilers, and ovens have been recently erected ; one of these is a brick oven, the

other is an iron oven, but the latter, from the bad mode of setting, would not act.

The women's wash-house has no gratings, no fixed tubs, and no drying stove.

The ablution-room at the end of a stable range has gratings and a bead to the table, but no pegs. There is a bath partitioned off from this room, with hot and cold water laid on. It has a grating, but no pegs nor form. There is a place with tubs for feet-washing. Another bath would be required for the reduced strength shown in the preceding table.

The saddler-serjeant's quarter is occupied by three families. The shoemaker's shop is similarly occupied. Both require a shaft and inlet for air, and remodelled grate.

A troop-room, with a small room for a kitchen, is occupied as a serjeant's mess. The mess-room requires ventilation similar to the men's rooms.

The library and reading-room are both in a small end room. The school-room is in a troop-room ; it requires ventilation like the other troop-rooms. At the back is a small yard enclosed as a playground. In the stables there is a small window at the end opposite the door, and the horses are arranged on each side of a very narrow central passage.

The temporary stable, already mentioned as being built against the side wall, cuts off the light of the proper stables. This might to some extent be remedied by putting a skylight in the roof of the temporary building over the stable windows. The stables have ventilation in the roof. There are litter sheds ; the roof is, however, so high, that they require a wall in front to keep off the rain. Litter sheds four feet six inches high are sufficient.

The pavement of the forge is smooth and slippery, it should be altered. That in front of the men's room is rough, and ought to be replaced by square setts.

The riding school is dark ; it wants light in the roof and ventilation.

Water is obtained from five pumps ; it is said to be good and abundant. There is no drainage except surface drainage.

The privies are of the usual ladder form of construction, and are placed over a cesspit. They have no light nor ventilation except by the door. They are very offensive, and ought to be reconstructed as water latrines, with divisions of seats, half-doors, adequate light, and ventilation. There would apparently be some difficulty in providing an outlet for the drainage, and if this cannot be obtained, the contents of the latrine should be flushed out daily into a cart and removed, on Macfarlane's plan, adopted at the Glasgow Barracks. There is a large ash-pit near the privies, which should be reduced in size, the bottom raised, and drained. The top should be covered, and a hopper provided, on Macfarlane's principle, to be opened only when refuse is being put in.

There is a ball court between the officers' quarters and the hospital. It has side walls and a gallery, but it is not covered.

The cells are provided with ventilation through the ceilings ; the passage has a stove, but more air should be admitted to it. Some cells have gas-burners under the control of the prisoners. The guard-room is light, but requires a shaft and a grate remodelled to warm air admitted. It has no lock-up.

The canteen tap-room requires an Arnott's ventilator in the chimney, perforated panes in the upper part of the window, and an improved grate. The non-commissioned officers' tap-room also requires an Arnott's ventilator.

Dundalk barracks afford a favourable example of good arrangement for cavalry. The stables are separate from the men's quarters. There are none of the customary nuisances which exist so abundantly close to men's rooms wherever these are placed over the stables, and we were struck with the much greater appearance of cleanliness and comfort pervading the whole establishment when compared with other barracks where a similar arrangement of stables and quarters has not been followed. The plan is very simple and sufficient, and should be adopted in all new cavalry barracks.

There are, however, several very important deficiencies in the accommodation. There are no married quarters, and at the time the return was made to us, there was a married couple accommodated in each barrack-room among the men. There is no day-room nor cleaning-room. There is no chapel, and divine service has to be performed in the riding school. The school-room and library, as well as the cook-houses and wash-houses, occupy barrack space very much required for the troops.

*In so far as concerns the existing Buildings, we would recommend :—*

1. That the number of men per room be reduced to the extent stated.

2. That each barrack-room be ventilated by a shaft ; two inlets, one on each side, and a remodelled grate. That each staircase be ventilated by a louvre through the roof. That each non-commissioned officer's room be ventilated by an Arnott's ventilator. That the school-room, saddler's quarter, and shoemaker's shop be ventilated by a shaft and inlet. That the canteen tap and non-commissioned officers' room be ventilated by Arnott's ventilators and perforated glass panes. The guard-room to have a shaft and remodelled grate, and more air to be admitted to the cells.

3. That the present cook-houses and wash-houses be provided with shafts and perforated panes, but that they be removed to detached buildings as soon as possible, and a proper laundry constructed.

4. Stables to have more light, in the manner recommended above.

5. Ablution and bath rooms to be provided with pegs and forms. One additional bath to be fitted up.

6. Privies to be reconstructed as water latrines on Macfarlane's principle, with divisions of seats, half doors, light, and ventilation ; drained to an outlet, or their contents removed daily, as suggested. Surface drainage to be improved by square setts opposite the men's quarters. Forge to be better paved. Ash-pit to be raised above the level, paved, drained, and covered, as suggested.

### *Dundalk Barrack Hospital.*

The hospital stands in a corner of the barrack yard. It has a yard behind, but no proper enclosure in front ; close behind it there is a large extent of muddy ground at the mouth of the estuary.

The building consists of three floors. On the ground floor, on one side of the entrance passage, is the surgery. The serjeants' room and a store are on the other side, and the kitchen and scullery behind. Upstairs, on the 1st and 2nd floor, are the wards, six in number, with regulation accommodation for 28 beds, with from 540 to 689 cubic feet per bed. The following table gives the details of the accommodation :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 5 | 2 | 3 |
| 2 | 4 | 2 | 2 |
| 3 | 5 | 2 | 3 |
| 4 | 5 | 2 | 3 |
| 5 | 4 | 2 | 2 |
| 6 | 5 | 2 | 3 |
| Total - | 28 | 12 | 16 |

The wards are from 17 feet 6 inches to 17 feet 11 inches long, 16 feet 2 inches broad, and from 9 feet to 9 feet 6 inches high. Two on each floor enter

the one from the other, which is a very objectionable arrangement. The table shows that the wards are very much overcrowded. The rooms, for they are hardly fit to be called wards, should have no more than two beds in each, and if this were carried out there would be space for 12 beds at a little more than 1,200 cubic feet each.

Each ward has a window on either side, and one fireplace, with the ordinary pattern grate. In the upper wards the ceiling follows the line of roof for a short distance, and they are more lofty than the others.

There are Arnott's ventilators, and perforated panes in the windows. The lower part of the windows is fixed, and the upper part moves on a pivot. The windows should be altered to open with ordinary hung sashes. Shafts, inlets for air, and remodelled grates should be provided for the wards. There is neither ablution-room nor bath-room. The scullery, which has a flagged floor, is used for both purposes, for which it is eminently unfit. A proper bath and ablution room is much required, and space could easily be found for it over the kitchen, with access from the half landing in connexion with the water-closet already existing. The serjeants' room requires a window in the back wall. There is no accommodation for orderlies except in sick wards. Gas is laid on to the building. There is no hospital wash-house. Water is supplied from a pump, and there is a rain-water tank.

The dead house is in a corner of the back yard.

The privies occupy one side of the yard; they are of the usual construction, offensive, and connected with a cesspit behind, which is emptied from the outside. The ash-pit is also outside. The privies should be reconstructed as water latrines, with proper light and ventilation, the soil being drained to an outlet or removed in the manner proposed for the barracks.

This hospital requires extension to meet the requirements of the barracks, *and the following sanitary improvements should be carried out in the present buildings*:—

1. Reduction of the number of beds to two in each ward.
2. Ventilation of each ward by a shaft, inlet, and remodelled grate; windows to be hung with cords and pulleys.
3. A bath and ablution room, with one bath and an ablution table, with hot and cold water laid on; to be built over the kitchen, communicating with the hospital.
4. The serjeants' room to have a window to the back.
5. A hospital wash-house to be provided.
6. Privies in the yard to be reconstructed as water latrines, and drained to an outlet, or their contents to be removed in a cart.

JOHN SUTHERLAND.
DOUGLAS GALTON.
W. H. BURRELL.

To the Secretary of State for War.
*Barrack and Hospital Improvement Commission, February* 21, 1860.

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# LIMERICK DISTRICT.

SIR,

WE have inspected and made inquiry into the sanitary condition of the barracks and hospitals at the following stations in Limerick District, and have now the honour to report the result. The stations we have visited are:—

I. Limerick.
II. Templemore.
III. Cahir.
IV. Clonmel.
V. Waterford.

## I.—LIMERICK.

The following are the barracks we have inspected in this city:—

1. The New Barrack.
2. The Ordnance Barrack.
3. Limerick Castle.

### 1. THE NEW BARRACK.

The New Barrack is situated on a high airy position at the outskirts of the city. It is built in the form of a square, with a large parade ground in the middle. The soldiers' barrack-rooms are contained in two long ranges of buildings, parallel to each other, on opposite sides of the square. The officers' quarters occupy a third side, and the fourth side is completed by the provost establishment, an old hospital converted into a barrack-store, privies, cook-houses, staff serjeants' mess, the gateway, and guard-room.

The new hospital is situated on the south-east side of the enclosure, behind the soldiers' quarters.

The natural facilities for drainage are excellent.

The officers' quarters are tolerably good, and there is an excellent mess-room.

The soldiers' barracks consist of two classes of houses, of which the more recently constructed are the larger, and contain a better class of rooms. The houses are three stories high, with a stone staircase in the centre, and the rooms enter right and left from the landings.

Half way up each flight of stairs is a serjeant's room, built out behind the line of the range; and at the end of the barrack-rooms, in the older houses, are smaller rooms, constructed for five men, several of which are used for non-commissioned officers. Five of these small rooms on the ground floor have been cut off from the adjoining barrack-rooms, provided with a separate entrance from the external air, and ventilated for the purpose of ablution-rooms.

The soldiers' rooms are of two sizes. The newer and better class of rooms are 36 feet 6 inches long, 22 feet wide, and 10 feet 2 inches high. The length and breadth of these rooms appear to us to be among the best adapted for barrack-rooms of any we have seen. The rooms are light, and capable of good ventilation.

The older barrack-rooms are 29 feet 10 inches by 18 feet 3 inches, and 10 feet high.

The joists of the flooring and the floor boards of the rooms above form the ceiling of the rooms below, a defect which is complained of, from its permitting the dust from the former to fall into the latter.

The rooms are long rooms, with three windows on each side, with the men's beds ranged between the windows. In the newer rooms the windows are of good dimensions, viz., 6 feet high by 4 feet wide. In the older rooms the three windows facing the square are somewhat smaller than those in the newer rooms; and the three windows facing the boundary wall of the barrack are only about half the size.

Every barrack-room has two fireplaces, one at each end in the length. One of these fireplaces has been built up, and recently an opening has been made into the chimney of this built-up fireplace, to convert it into a ventilating shaft for the room. There are, however, no inlets for air, so that the ventilation is incomplete.

The serjeants' rooms are likewise deficient in ventilation, and require a silk flap ventilator into the chimney. All the barrack-rooms should have the grates remodelled, to save heat.

All the barrack-rooms are considerably overcrowded. In the larger rooms the construction gives 554 cubic feet per man for 306 men. The smaller rooms give 389 cubic feet each for 392 men, and the smallest 5-men rooms give 432 cubic feet per man for about 120 men.

The total barrack accommodation is for 887 non-commissioned officers and men.

The following table shows the present regulation accommodation of this barrack, in comparison with what it would be if each man had 600 cubic feet allotted to him.

| Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| H House : | | | |
| Nos. 1, 2, 4, 5, 7, 8 - - | 108 | 84 | 24 |
| I House : | | | |
| Nos. 1, 2, 3, 5, 7, 9 - - | 84 | 54 | 30 |
| Nos. 2 (inner), 4, 6, 8, 10 - | 25 | 20 | 5 |
| K House : | | | |
| Nos. 12, 13, 15, 17, 19, 21 - | 84 | 54 | 30 |
| Nos. 14, 16, 18, 20, 22 - | 25 | 20 | 5 |
| L House : | | | |
| Nos. 23, 25, 27, 29, 31, 33 - | 84 | 54 | 30 |
| Nos. 24, 28, 30, 32, 34 - | 25 | 20 | 5 |
| M House : | | | |
| Nos. 36, 37, 39, 41, 43, 45 - | 84 | 54 | 30 |
| Nos. 38, 40, 42, 44, 46 - | 25 | 20 | 5 |
| N House : | | | |
| Nos. 47, 49, 51, 53, 55, 57 - | 84 | 54 | 30 |
| Nos. 48, 52, 54, 56, 58 - | 25 | 20 | 5 |
| O House : | | | |
| Nos. 1, 3, 5, 6, 8, 9 - - | 108 | 84 | 24 |
| P House : | | | |
| Nos. 1, 3, 5, 7, 8, 9 - - | 108 | 84 | 24 |
| Total - - | 869 | 622 | 247 |

This table shows the results of dividing the cubic space in each house, as nearly as possible, in the ratio of 600 cubic feet per man. It hence follows that, instead of there being accommodation for 869 men, there is space for no more than 622 men, and hence 247 men ought to be removed from the construction.

This should be done as follows :—

1. Out of each 18-men room in houses H, O, and P, *four* men should be removed.

2. Out of each 14-men room in houses I, K, L, M, N, *five* men should be removed.

3. Out of each 5-men room in the latter houses *one* man ought to be removed.

In six of the rooms there is a serjeant's berth. The serjeant should be counted as one man, and, if he is married, his wife should also count as one man on the construction. In reducing the overcrowding in all barrack-rooms, this same principle ought to be applied until all married people have quarters provided for them out of barrack-rooms.

We have dealt with the room accommodation as it is given in the returns sent to us, but all the rooms are not occupied by men, for some of the rooms are misappropriated to married soldiers and their families. A large barrack-room was also occupied as a shoemaker's shop, on account of there being no such shop in the construction. Another large room was used as a quartermaster's store and office, and a room was temporarily set apart for rifle instruction.

There is no day-room for the men.

The barrack-rooms are lit with candles, for which gas should be substituted.

There is a library, but no reading-room attached to it.

The lavatories, as already described, are in the barrack ranges under the rooms, but cut off from them, and having separate entrances from the outer air, and means of thorough ventilation.

There are no baths, and there is no room for any in the lavatories, which are, in fact, not large enough for their present purpose. As there is plenty of space within the barrack boundaries, a proper bath-room ought to be built, with one bath for every 100 men, and water laid on.

There is no laundry in this barrack. There is only a small women's wash-house, with two boilers, but defective in other requirements. There are no fixed tubs, and no laundry or drying stove, and the boiler accommodation is much too small for the amount of washing required. It is stated that nine boilers would be required for the purpose. This wash-house should be properly fitted up with boilers and fixed wash-tubs, with water laid on, drying stove, laundry stove, and means of ironing and getting up linen. The wash-house should also be ventilated at the roof. It would, perhaps, be more economical to construct a proper laundry than to improve the present defective building.

There are two pentagonal kitchens, with a central chimney, and the boilers (fifteen in each kitchen) ranged round them. The space between the boilers and the outer walls is rather too narrow.

While we were there, ovens for improving the cooking had just been completed, but as they were not ventilated, meat could only be baked, but not roasted, in them. This defect, however, admits of easy remedy.

There are no cleaning-rooms, nor covered drill sheds.

The accommodation for trades is very deficient. It is limited to one tailor's shop, much too small, and to a small forge. It would be very advantageous to extend this species of accommodation.

The water supply is derived from the water company's works, and is stated to be sufficient in amount.

The barrack is surface drained into the town sewers. At the time of our inspection, one privy was being drained, with the view of converting it into a water latrine. The other privies (seven in number) were to be left in their present state. They are connected with cesspits close to the barracks, and considerable nuisance arises from them, especially during the process of cleansing.

When there is so good a fall for the drainage, and plenty of water, there is no necessity for the existence of cesspits. We would therefore recommend that all of them be abolished throughout the barracks, and that water latrines, properly drained, be constructed instead of the present privies. These latrines should be properly lighted and ventilated through the roof, and they should have divisions of seats and half-doors.

The ash-pit is situated at a considerable and inconvenient distance from the barracks. It ought not to be brought nearer, but it would be far better to place a couple of iron carts at convenient points for the collection and daily removal of all barrack refuse.

The guard-rooms are small. They require addi-

tional ventilation through the roof, and remodelled grates. The lock-up is part of one of these guard-rooms. It is separated by an iron railing from the part occupied by the soldiers. It is too small, and requires enlargement.

The canteen tap-room requires ventilation, by an Arnott's silk flap ventilator into the chimney, and by perforated glass panes in the windows. The canteen keeper's accommodation is very limited.

The floor of the depôt orderly-room is flagged. It is nominally a serjeant's room. This room requires a wooden floor.

There are good staff quarters. There is an excellent serjeants' mess-room, lit with gas at the serjeants' expense. When the whole barrack is lit with gas, this room ought be included.

The provost establishment is confined for space, especially in the yard. The privy empties into a cesspit, which ought to be removed, and a water latrine substituted.

There is a temporary infant school in a hut. The chapel school is a very good building for its purpose, but requires ventilation above.

All these schools are built very much on the same model, but the air in the cubic space above the heads of the windows is generally stagnant from want of roof ventilation. This defect could be easily and cheaply remedied by inserting ventilating tiles into the ridge.

The stables in these barracks are dark and badly ventilated; they require additional window space, ventilating shafts through the roof, and perforated glass panes to admit air.

*The following are the Sanitary Improvements required for Limerick New Barracks:—*

1. Reduction of the number of men in all the barrack-rooms to the extent specified.

2. Providing an inlet for air over the centre window on each side of the barrack-rooms, and diffusing the air through perforated zinc cornices.

Remodelled grates, for warming the air in winter, to be introduced into every barrack-room.

Serjeants' rooms to be ventilated by an Arnott's silk flap ventilator into the chimney.

Ventilation of chapel school, guard-rooms, and canteen to be improved as suggested. Stables to be ventilated by shafts through the roof, and by perforated glass in the windows.

Canteen tap-room to be ventilated by an Arnott's silk flap ventilator, and by perforated panes of glass in the upper sash of the windows.

3. Introducing a ventilated gas-burner into every barrack-room.

4. Providing day-rooms for the men.

5. Constructing a bath-room, with baths in the proportion of one bath to every 100 men, having water laid on. The lavatory accommodation might also be extended, by adding to it in these buildings.

6. Women's wash-house to be improved as suggested; or a suitable laundry, with boilers and water laid on, fixed tubs, drying closet, laundry stove, &c., to be provided; also a place for ironing linen, gratings, and additional light and ventilation through the roof.

7. New ovens in the barrack cook-houses to be ventilated, so as to roast meat.

8. Cleaning sheds and drill sheds to be provided.

9. All cesspits within the barrack precincts to be abolished.

All privies to be converted into water latrines, supplied with water, and drained. To be reconstructed with divisions of seats and half-doors, and the buildings to be suitably lighted and ventilated through the roof. Urinals to be supplied with water.

10. Ash-pits to be removed, and iron carts substituted, for the daily collection and carrying away of all barrack refuse.

Lastly. Married quarters ought to be provided, and the accommodation for pursuing trades extended.

*New Barrack Hospital.*

This is a depôt hospital, and is one of the best military hospitals we have seen in the course of our inquiries; but, as we shall presently show, it has some rather important defects, both in structure and internal arrangement.

It is situated on high ground, immediately south-west of the barrack, and facing on one side the open country. The whole building is of stone, and exhibits a considerable advance in army hospital architecture.

The building consists of a single block, three flats in height, the ground plan of which is a parallelogram. On one side, the ends project a little beyond the line of the building, and a verandah is carried along between them. It would be an improvement to place a few seats for convalescents in this verandah. A wide passage and staircase go right through the building, in the middle of its length, and, running at right angles to the direction of this passage, there is on every flat an internal corridor, with wards or offices opening out of it on either side. On the lower flat, the corridor passes through the block of building in its whole length, but on the two upper flats, where the sick are placed, each branch of the corridor, in place of terminating in the open air, has a blind end, out of which the end wards open. This is certainly a defect in the original structure, which it would be well to avoid in future hospital plans.

The ground floor is occupied by serjeants' rooms, surgery, kitchen, baths, &c. The sick wards are situated on the two upper flats. These wards are of two classes, larger and smaller. The larger wards are situated at the ends of the short corridors, and occupy the whole width of the building, an arrangement by which they have windows on three sides, with abundance of light and means of natural ventilation.

The smaller wards open right and left out of the corridors. They have windows to the open air only on one side, and are consequently deficient both in light and ventilation.

There are in all ten wards, with 98 beds, exclusive of a prisoners' ward on the lower story, not on the original construction of the building. There is also a good detached itch ward.

The following table shows the accommodation within the hospital, compared with what it would be at 1,200 cubic feet per bed:—

| Wards. | Regulation Number of Beds. | Number at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| Small, 1, 3, 4, 6, 8, 9 - - | 30 | 18 | 12 |
| Large, 3, 7, 8, 10 | 68 | 44 | 24 |
| Total - - | 98 | 62 | 36 |

These wards will hold 62 beds at 1,200 cubic feet each, and the hospital is hence overcrowded to the extent of 36 beds.

There are no special means of ventilation provided for the wards, but the present means may be easily improved so as to be sufficient.

The large wards, as already stated, have windows on three sides, and they have each two fireplaces. We should propose to improve the ventilation in these wards, by introducing an Arnott's silk flap ventilator, of the largest size, into each chimney, close to the ceiling, and to insert, at the same time, one pane of perforated glass into the top of each window frame.

The fire-grates waste a great amount of heat, and should be remodelled, with means of warming air in winter.

A swing window placed over the door of the larger wards, in the same manner as has been done

in the smaller wards, will also facilitate the ventilation.

The smaller wards, being not so well provided with the means of natural ventilation as the larger wards, will require a shaft carried up from the ceiling to above the roof of the hospital, and to have a perforated glass pane inserted into the top of each window frame.

The hospital is lit by dipped candles. The lighting is quite insufficient. Gas should be introduced into both wards and passages, and each ward ought to have a ventilated gas-burner provided for it. A gas lamp ought also be placed outside the hospital.

There is a bath-room and lavatory on the ground floor of the building, quite away from the wards. There is a stone bench, with metal basins, and two tin slipper baths. There are also boilers for hot water. The floor of the room is flagged. These arrangements are defective; and it would be very advisable to improve them, in the manner to be hereafter mentioned, by providing a bath-room and lavatory for each flat of wards.

There is a wash-house in one corner of the hospital square, but it is little used, as the washing is done out of hospital. It has no means of drying or getting up linen. It should have proper laundry arrangements introduced in it.

The kitchen arrangements are sufficient.

The water supply is derived from the water-works, and is forced to the roof of the building by a force pump.

The facilities for drainage are the same as already described for the barracks.

The great defect of this hospital is the water-closets. There are two ranges of them, situated in long narrow rooms, within the building, and opening directly from the corridors, and close to the wards. Their position is altogether objectionable; besides which they have been very defectively constructed and arranged, so much so that some of them cannot be used. Water for them is supplied by a force pump, as already mentioned.

Nothing short of entire reconstruction will render these water-closets safe. A suitable projection, with independent ventilation, should be built out behind the line of the buildings, and accommodation provided in it for water-closets and lavatories, as well as for a fixed bath, with hot and cold water, for each flat. We would advise these improvements to be at once carried out.

There is a privy in the hospital square, in a very offensive state. This requires reconstruction as a water latrine, with divisions of seats, and half doors, and plenty of light.

There is no accommodation for the sick of soldiers' families, yet the medical officer is obliged to find room in some part of the hospital for bad cases occurring among children. This deficiency requires to be supplied.

*The following are the Sanitary Improvements required for this Hospital:—*

1. Reduction of beds in the wards, to give 1,200 cubic feet per bed.

2. Ventilation of the larger wards by Arnott's ventilators, by perforated panes, and by a swing window over each door, as pointed out. Small wards to be ventilated by a shaft and perforated glass panes. Also the fire-grates in all the wards to be reconstructed, to economize heat and to warm part of the admitted air in winter.

3. Passages and wards to be lit with gas, the latter by ventilated gas-burners.

4. Water-closets, lavatories, and bath-rooms, with hot and cold water, to be constructed for each flat, beyond the line of the buildings, as recommended. The privy in the hospital yard to be converted into a water latrine, with divisions of seats, half-doors, and plenty of light.

5. Wash-house to be provided with means of drying and getting up linen.

Lastly, provision ought to be made for accommodating sick wives and children of soldiers.

As will presently be shown, this is the only military hospital in Limerick fit to receive the sick, and yet the accommodation it affords for the usual sick of the depôt is too limited. Two detached blocks could easily be added on a healthy plan, to afford the required hospital accommodation for all the barracks in Limerick, and this appears to us to be the best course to recommend in regard to it. The requisite accommodation would thus be obtained, the administration would be consolidated, and the other very defective hospitals could be suppressed, and their cost saved.

### 2. The Ordnance Barrack.

This barrack is situated at a short distance from the New Barrack. It is surrounded by houses, though near the outskirts of the city.

The barrack consists of a single block of buildings, three stories high, and a basement. A portion of the same block is used as officer's quarters.

Behind the block is a small court-yard, in which are situated the cook-house, latrines, lavatories, &c., and in front of the block is a spacious barrack square, round which are situated ordnance stores, offices, &c. This court-yard, like the court-yards of barracks generally, is defectively paved, and ought to be relaid with square setts, and proper surface drainage, at the earliest opportunity.

The stables are in a separate square, to the right of the square in which the barracks stand.

A passage and staircase divide the portion of the barrack used by the men into two parts, and the rooms enter right and left of the passages. Each upper floor room extends from back to front, and has two windows at each end. The barrack-rooms in the basement have windows only on one side. All the upper rooms have two doors into the passages.

The rooms are of two sizes. Those in the basement, four in number, hold eleven men each, and each of the six rooms on the upper floors contain 20 men. There are in all, ten rooms, with regulation accommodation for 164 men. The following table shows what the amount of accommodation would be at 600 cubic feet per man.

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Nos. 1, 2, 3, 4, 5, 6 - - | 120 | 96 | 24 |
| Nos. 7, 8, 9, 10 | 44 | 24 | 20 |
| Total - - | 164 | 120 | 44 |

The deficiency of accommodation in cubic space is that for 44 men; but this does not represent the total deficit.

The four last rooms in the list are all basement rooms, which are unfit for barrack-rooms. They are now occupied by married serjeants. These rooms should be struck off the construction, and when this is done the available accommodation which the present buildings will afford, at 600 cubic feet per man, is sufficient for 96 men, and no more.

To effect the necessary reduction of numbers, therefore, two steps must be taken:—1. The basement rooms must be evacuated. 2. Four men must be removed out of each of the other rooms.

All the upper rooms are ventilated, but not sufficiently so. There are two fire-places, one of which has been built up, and an Arnott's ventilator inserted into the chimney. Inlets for air are also provided by auger holes in the window frames and in the doors. It will be necessary to extend this provision as follows:—The opening made into the disused chimney

should be enlarged to double the sectional area of the chimney, and an air brick should be introduced close to the ceiling, between each pair of end windows, to admit air, and a perforated zinc cornice should be placed over each opening, to diffuse the current.

The grates are large, and waste much heat. They might be advantageously reconstructed to warm part of the admitted air.

The basement rooms, if used by married non-commissioned officers, ought to have an Arnott's silk flap ventilator inserted into each chimney close to the ceiling.

The guard-room requires ventilation by a shaft and inlet for air.

The whole barrack is lighted by candles, although gas could be readily obtained. We are of opinion that a ventilated gas-burner ought to be introduced into each room.

There is neither day-room, cleaning-room, drill-shed, school-room, nor library attached to this barrack.

The collar makers' shop is used as a school-room. It is warmed by a stove. If this room is to be used in future for a school-room, the stove-pipe, instead of being carried through the wall, might be carried up through the roof, and by leaving a space round the pipe where it pierces the roof, the room would be efficiently ventilated, and heat would be economized in winter.

There is one lavatory. It is rather dark, and would be improved by additional light through the roof.

There is no bath attached to it, but in lieu of a bath a cast-iron coal-box is used. One fixed bath, with water laid on, and properly separated from the lavatory is required.

There is a small women's wash-house, with one boiler, but there are no fixed wash-tubs, and no drying or laundry stove. These defects ought to be remedied.

The cook-house is supplied with boilers and a small oven. This latter ought to be removed, and a suitable roasting oven substituted.

There is a collar makers' shop, wheelers' shop, and forge, but there is no tailors' shop.

The water supply is derived from the water mains, and is stated to be sufficient.

The barrack is partly drained into the town sewers, and the drainage is stated to be efficient, but it requires to be improved in some important particulars.

Notwithstanding the drainage, the privies are placed over cesspits of the most offensive character. One of the most urgent improvements required for these barracks is that these privies be reconstructed as water latrines, with divisions of seats, half-doors, and sufficient light, and that they be connected with the sewers, and the present cesspits abolished. There are three privies, and all require to be reconstructed as described.

The urinals require to be supplied with water for flushing and cleansing them.

The ash-pits of this barrack may very well be dealt with by providing for the daily collection and removal of all barrack refuse in iron carts.

*The following are the Sanitary Improvements required:—*

1. The basement rooms to be struck off the construction, as being unfit for barrack-rooms.

2. Four men to be removed out of each of the other barrack-rooms.

3. Each barrack-room to be ventilated by an opening into the built-up chimney double its area, and by inlets for air as described. Basement room to be ventilated by a silk flap chimney ventilator. Fire-grates in barrack-rooms to be remodelled. Guard-room to be ventilated by a shaft, an inlet for air being afforded by a remodelled grate.

4. A ventilated gas-burner to be introduced into every barrack-room.

5. A bath-room, with one bath, and water laid on, to be provided. Lavatory to have additional light through the roof.

6. Women's wash-house to be improved, by having fixed tubs, with water laid on, and a drying stove.

7. A roasting oven to be supplied to the cook-house.

8. All the privies to be reconstructed as water latrines, and drained; to have divisions, half-doors, and increased light. All cesspits to be abolished.

9. Urinals to be supplied with water.

10. Better arrangements for collecting and removing the barrack refuse and horse manure.

The question as to providing increased accommodation for married soldiers in these barracks should be considered, along with that of making a similar provision for the New Barracks; but in any case the accommodation is required.

*Ordnance Hospital.*

This is a very defective hospital, and is scarcely fit to receive sick. It is not within the barrack precincts, but is situated on the opposite side of the public highway. The building occupies a small angle of ground, shut in by high walls, and having a noisy market for cattle and farm produce on two sides of it. The situation is altogether a bad one, and would not be suitable even if the building itself were unexceptionable, which it certainly is not. The hospital is a small, inconvenient, ill-arranged house, three stories high. The lower story is occupied by the offices, and on the two upper stories are four wards, capable of containing in all twenty patients, according to existing regulation. The wards are very low, and defectively ventilated, and they are much overcrowded.

The following table shows the accommodation:—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1, 2 | 10 | 4 | 6 |
| 3, 4 | 10 | 2 | 8 |
| Total - | 20 | 6 | 14 |

Two of the wards have an Arnott's ventilator in the chimney; the other two wards are not ventilated. In none of the wards is the ventilation sufficient. Each ward has two windows. A third window ought to be opened in the back wall of each ward. As these wards can only properly accommodate two patients each, the expense of a ventilating shaft and inlet, with a zinc cornice, will scarcely be justifiable. If the reduction in numbers proposed be made, an Arnott's silk-flap ventilator in each chimney, with perforated panes of glass in the windows, would suffice. The staircase should, however, be ventilated by a shaft through the ceiling and roof of the building, and by a perforated glass pane in the upper part of each window sash. It would much improve the staircase to open a window through the back wall.

The kitchen is sufficient, but requires ventilation.

There is no water-closet belonging to the hospital, but in the yard there is a very offensive privy, placed over a cesspit, which is covered simply by the floor-boards of the privy. These boards have to be lifted up when the cesspit is cleaned out. This nuisance ought at once to be removed, and a properly drained water-closet put up instead.

The water supply is stated to be very imperfect.

There are no means of washing the hospital linen,

except in the kitchen. The provision store is the serjeant's-room.

There is no bath nor lavatory belonging to the building. The sick wash in the yard.

There is no ground on which convalescents can walk. The medical officer is obliged to have them taken out in the hospital cart.

This hospital, as well as the one in Limerick Castle, about to be described, belongs to a class of regimental hospitals by no means few in number, which it is difficult to know what to do with. The buildings are quite unfit for hospitals, both from their small size and from their defective construction and arrangements. To make them suitable for sick would involve their being rebuilt, with sufficient conveniences and proper sanitary arrangements; while, to administer them efficiently, and with a due regard to the well-being of the sick, would necessitate a large current outlay for a very few cases of disease. In such an example as Limerick affords, it would be much better to consolidate the hospital establishments of the garrison, by extending the depôt hospital at the New Barracks, to give the required accommodation. We are informed that the Ordnance Hospital could be sold at a high price, for extending the market, which is, perhaps, the best thing that could be done with it.

Our experience of these small hospitals is, that they delay recovery and convalescence, sometimes for weeks or months, and that, in some cases, all they are good for is simply to afford space for sick men drafted out of barrack-rooms, in many of which they would have a better chance of speedy recovery than they have in such hospitals.

*With regard to the present Sanitary Requirements of the Ordnance Hospital, we would recommend:—*

1. Reduction of number of beds from twenty to six.

2. Opening additional windows into the wards and staircase, as already stated. Ventilating the wards as described. The ward grates to be remodelled. The staircase to be ventilated by a shaft through the ceiling and roof, by an additional window, and by perforated glass panes in the upper sash of the windows.

3. The hospital to be drained, the privy to be removed, the cesspit abolished, and a water-closet substituted.

4. A bath-room, with fixed bath, and hot and cold water laid on, along with a lavatory, to be provided.

The only good thing in the arrangements of this hospital is that there is no ash-pit, and that all the refuse is removed daily, a procedure which ought to be imitated in all barracks and hospitals.

### Limerick Castle Barracks.

Limerick Castle is situated at the outskirts of the city, and overhangs the river Shannon. The situation is airy, but the neighbouring part of the town is in a very bad sanitary condition, and abounds in nuisances; while, at the same time, the ground occupied by the barracks is surrounded by high walls, which interfere materially with the external ventilation.

The barracks form three sides of a square, and the soldiers' rooms are in two houses, A and D. Each house has six rooms, and each room has regulation accommodation for 17 men.

The rooms have two windows on each side, and two fire-places; one of them has been built up; the chimney of it could easily be rendered available for ventilating the room, in the manner already mentioned.

The passage giving access to each house runs right through it, and the staircase occupies the whole depth of the building.

The following is the accommodation, compared with what it would be at 600 cubic feet per man:—

| Rooms. | Total Regulation Number of Men. | Total Number at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 12 | 204 | 132 | 72 |

The barrack-rooms will, therefore, accommodate no more than 132 men, and it will be necessary, in order to give the required space, to reduce the number of men in each room from 17 to 11.

Ventilation is partly provided for by an Arnott's ventilator into each open chimney, but this is not sufficient. An opening, covered by a grating, should be made into the disused chimney, the area of which should be double the area of the chimney. A ventilating shaft would thus be easily obtained.

Fresh air should, at the same time, be supplied by an air-brick and perforated zinc cornice between each pair of windows on the opposite sides of the room.

The grates should be remodelled, to save fuel and to warm part of the inflowing air in winter.

The barrack is lit by candles. Gas can be obtained, and a ventilated gas burner ought to be introduced into each barrack-room.

There is neither day-room, school-room, library, cleaning-room, nor covered shed for drill, in these barracks.

There are two lavatories, but no baths. Two baths, with water laid on, and a suitable bath-room, are required.

There are two women's wash-houses, with boilers; but there are no fixed tubs, and no drying or laundry stove. They require more light.

There are two kitchens with boilers, and an oven had been erected shortly before we were at the barracks. These kitchens also require more light.

There are no workshops, except an armourer's shop.

There is a water supply, derived from the city mains.

The privies are drained directly into the Shannon, but, not being properly supplied with water, they were very offensive. They require reconstruction as water latrines, with divisions of seats, and half-doors.

The urinals require to be supplied with water.

The ash-pit is placed immediately behind the barrack-rooms. It ought to be removed, and an iron cart substituted.

There is no accommodation for married non-commissioned officers or soldiers.

This is a small confined barrack, not admitting of extension; we shall, therefore, confine our recommendations solely to those essential for health.

*The following are the Sanitary Improvements required:—*

1. Reduction of the number of men in each barrack-room from 17 to 11.

2. A ventilating opening to be made into each of the disused barrack-room chimneys, close to the ceiling of the room, as described. Two inlets for air to be provided for each barrack-room, one on either side, and the air to be diffused by a perforated zinc cornice.

The barrack-serjeant's quarters to be ventilated by a shaft carried up from the back of each room, and warm air to be admitted by remodelling the grates.

Guard-room to be ventilated by a shaft through the roof, and by an inlet covered with perforated zinc close to the ceiling.

The grates of all the barrack-rooms, and of the

guard-room to be remodelled, to warm part of the admitted air in winter. The canteen tap-room to be ventilated by an air shaft, and perforated glass panes.

3. A ventilated gas-burner to be introduced into every barrack-room.

4. A bath-room, with two baths, to be constructed.

5. Women's wash-house to be provided with fixed tubs, with water laid on, and a drying stove, and more light to be admitted.

6. All the privies to be reconstructed as water latrines, with divisions of seats and half-doors. Urinals to be supplied with water.

7. Additional light to be admitted to the cook-houses.

8. The ash-pit to be removed, and the barrack refuse to be collected and removed daily in an iron cart.

*Limerick Castle Hospital.*

This hospital consists of a small badly constructed house, situated behind the barrack buildings, in an angle of the works, only a few feet removed from the officers' quarters. It is so entirely unfit for sick, that we concur in the opinion expressed by the medical officers and others that it should be taken down. It interferes materially with the limited ventilation of the barrack offices, and is so badly planned and arranged, that nothing short of its reconstruction would be of the least use. This we cannot recommend, because we are of opinion that to reconstruct it in such a situation would be a needless expenditure of public money. At present, any serious case is removed at once to the depôt hospital at the New Barracks ; and this indicates a course of proceeding which ought to be followed with many other small hospitals in different parts of the United Kingdom.

## II.—TEMPLEMORE.

### Infantry Barracks.

These barracks are situated at a distance of about half a mile from the town of Templemore, in an open, flat country, with very few houses near them.

The area within the barrack inclosure is ten acres, Irish plantation measure. The subsoil rests on limestone near the surface. The buildings are of stone and were erected between 1808 and 1810.

They consist of six blocks of houses, arranged in the form of two half squares. Four blocks contain the soldiers' houses, and the officers' quarters occupy two blocks.

The blocks are three stories high. Each house has six soldiers' rooms and three serjeants' rooms, with a good stone staircase extending up the middle of the house.

There is no passage for fresh air through the house, but the ventilation of the staircase might be improved, by opening a window through its back wall, and by introducing panes of perforated glass into the upper sash of each window.

The larger rooms are well proportioned, and of a good height. They are 27 feet 6 inches long, 20 feet 2 inches broad, and 10 feet 11 inches high. The smaller rooms are about 16 inches lower, and are not so good.

The rooms go through and through the buildings, and have each four windows, two to the front and two to the back. The windows are of a good size, and the rooms have sufficient light. There is a fireplace at each end of the rooms ; one of these is not used.

The barracks contain in all 75 rooms for men, and 39 for serjeants. The men's rooms may be arranged in two sizes, with different cubic capacities, mainly arising from the difference of height of the rooms in different flats. All the rooms have regulation space for 15 men each, and are considerably overcrowded. The following table gives the accommodation :—

| Number of Rooms, Houses A to N inclusive. | Total Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Larger, 49 - | 735 | 490 | 245 |
| Smaller, 26 - | 390 | 234 | 156 |
| Total - | 1,125 | 724 | 401 |

In allotting 600 cubic feet per man, the accommodation, it will be seen, is deficient by above 35 per cent.

To afford the space required by our instructions, it will be necessary to remove five men out of every one of the 49 rooms in the first series, and six men out of each of the 26 rooms in the second series, which will reduce the total available accommodation in the barrack to that for 724 men.

None of the rooms are ventilated, but this defect could be easily remedied by making use of the blank chimney flue as a ventilating shaft. To do so, it will be necessary simply to make an opening into it near the ceiling, with a sectional area double that of the flue, and to cover the opening with a grating. Two air bricks would have to be inserted close to the ceiling of each room, one air brick on each side of the room. The openings of these inlets would have to be covered by short perforated zinc cornices for diffusing the air.

The serjeants' rooms require a silk flap ventilator to be placed in each chimney for ventilation. The serjeants' mess is in a barrack-room with two chimneys. One of these should be converted into a ventilating shaft, as recommended above for the barrack-rooms, with ventilating openings between the windows, to admit air. The guard-room requires ventilation by a shaft and inlet.

All the fire-grates waste much heat, and it would be very advantageous to replace them by remodelled grates, for warming a portion of the air admitted to the rooms in winter.

The barrack is lit with candles and oil lamps. Gas is not available at present.

There are no day-rooms for the men. The necessity for this accommodation is so obvious in all the barracks we have visited, that it should be supplied on some systematic plan, with the view of inducing the men to spend their time profitably, instead of frequenting the canteen, or going into the town.

There is a good chapel school, built in the year 1854.

There is an infant school and lecture-room, both of which require ventilation by shafts and inlets for air.

The ablution-houses have no pegs, and they require ventilation through the roof.

There are no baths. The lavatories are not large enough to hold the required number of basins, and it would be advisable to build a suitable bath-house, with a bath for every 100 men, and water laid on.

There are no quarters for married people. When there are any rooms in the barracks unoccupied, they are permitted to be used for this purpose.

There are three soldiers' cook-houses, with ten boilers in each ; but there are no other means of cooking. The houses are dark and defectively ventilated. Additional light by windows or skylights should be provided, and the ventilation should be improved by louvres in the roof. A roasting oven is also required for each cook-house.

There are no cleaning-rooms. There is a good covered drill shed 183 feet 6 inches long, 12 feet wide, and 11 feet high. It is a lean-to against a wall, and the roof is supported by 17 cast-iron pillars.

It would be advisable to extend this accommodation, as the present shed is not large enough.

There is one tailor's and one shoemaker's shop, and the usual armourer's shop. They are lean-to buildings, and too dark. The lighting might be improved, but the shops would never be good; it would be better to build others.

There are three wash-houses, one lately built, and tolerably good, but the other two very bad and unsuitable. The accommodation in the best of them is far from being sufficient. The house was crowded with women when we saw it, so much so that there was hardly room to turn in the place. The best wash-house has four boilers, the other two have one boiler each. There is no drying-room or means of getting up linen, and the water supply is so defective, that water has to be brought in carts.

The accommodation for washing linen in this barrack requires to be extended, and a drying-room is very much wanted. Ventilation is also required for the existing wash-houses by louvres in the roof.

The whole water supply of the barracks is very defective; it is at present obtained from one artesian well and five pumps. The water from two of the latter is not fit for use, on account of the wells being polluted by infiltration from privies and urinals a few yards distant. The amount of labour expended in supplying this barrack very insufficiently with water is considerable, and the supply can never be depended on for sanitary purposes, so long as the present system is pursued.

There are very good water springs at a short distance, which might be conducted at little cost, and distributed all over the establishment. It has been proposed, we believe, to do this, and the works should be carried out without delay.

It would be useful to collect the roof water in tanks for the wash-houses, on account of its softness.

This barrack is not properly drained. All the refuse is received into cesspits, and there is evidence, in the state of certain of the wells, that the subsoil in their vicinity is to some extent saturated with cesspool matter.

The latrines are mere open privies, of the uusal construction, and excessively offensive. The whole of them require to be reconstructed as water latrines, and proper sewerage laid down for draining away their contents. They should have divisions of seats and half-doors. Water-closets ought to be provided for the officers' quarters.

There is a drainage outlet into a small river about a quarter of a mile distant; but it would be a better plan to apply the sewage to meadow land not nearer than 500 yards from the barrack, if such could be obtained. Otherwise, a proper sewage tank ought to be constructed near the outlet stream, where the sewage could be deodorized, and the fluid part allowed to overflow, while the solid residue might be used for manure. It is absolutely necessary for the health of the barrack that some such plan be adopted, and the present cesspits abolished.

The urinals should, at the same time, be reconstructed and drained.

The surface drainage of the barrack passes away through 24 gully grates, 18 of which are untrapped. Traps should be placed on all of the gullies, and the surface drains connected with the general system of sewerage for the latrines and urinals.

There are no staff-sergeants' quarters, and there is not sufficient accommodation for quartermasters' stores.

Several soldiers' rooms have been misappropriated for barrack stores, &c. If proper stores were provided, these rooms might be restored to the barrack accommodation, and afford part of that required to receive the men from the present overcrowded rooms.

The library is rather small, and the reading-room requires ventilation.

The officers' quarters are stated not to be sufficient, but it is stated that they could be rendered so by the purchase of a neighbouring house for the use of the commandant, whose present quarters could be added to the officers' accommodation.

The ash-pits of this barrack give rise to nuisance. They ought not to be allowed to exist within the barrack boundary. We would advise their being removed, and arrangements made for collecting and removing the refuse of the entire barrack and hospital, day by day.

*We would recommend the following Sanitary Improvements to be carried out:—*

1. Reduction of the numbers of men in each barrack-room to the extent specified.
2. Ventilating every barrack-room by converting the blank chimney into a ventilating shaft, with an opening having a section double that of the shaft, and by inlets for air through perforated zinc cornices, as described.

Ventilating the staircases by opening a window to the back, and by a perforated glass pane in the upper sash of the stair windows.

Ventilating the serjeants' rooms by a silk flap ventilator in the chimney.

Ventilating the serjeants' mess, infant school, reading-room, and guard-room, by shafts and inlets, as described. Ventilating the canteen-rooms by silk flap ventilators in the chimney, and by perforated panes in the windows.

3. Remodelled fire grates, to save fuel and warm part of the admitted air in winter, to be provided for all the barrack-rooms.
4. Ablution-rooms to be ventilated and provided with pegs.
5. A bath-house, with a bath for every 100 men, and water laid on, to be provided.
6. Cook-houses to have additional light and ventilation through the roof, and each house to be provided with a roasting oven.
7. Extension of the drill shed.
8. Workshops to be enlarged and improved as suggested, or to be rebuilt.
9. Wash-house accommodation to be extended. Ventilation to be provided by louvres in the roof. A drying-room and means of getting up linen to be provided.
10. Water supply to be improved, by conducting spring water to be laid over the barracks, and roof water to be collected for washing.
11. Barrack to be properly drained to an outlet; all the gully grates to be trapped; all privies to be converted into water latrines, properly drained, and to have divisions of seats and half doors. All cesspits throughout the barracks to be abolished, and the latrine drainage disposed of in one of the modes pointed out. Water-closets to be provided for officers' quarters. Urinals to be re-constructed, drained, and supplied with water.
12. Ash-pits to be abolished, and means provided for collecting and removing the whole solid refuse of the barrack daily.

Lastly. Married quarters and other quarters at present deficient should be provided in suitable buildings, or by re-arrangement of the accommodation, as far as practicable.

The barrack was only partly occupied when we inspected it, and there were 35 women and about double that number of children in it. Were the barrack fully occupied the number of women and children might be doubled.

### *Hospital, Templemore.*

This is a double hospital, consisting of two houses, built in line, exactly like each other, and having everything in duplicate.

It is is situated behind the barrack, close to the boundary wall, behind which is a dense screen of lofty trees, interfering very materially with the external ventilation of the buildings, and stagnating the air round them.

Each hospital has a staircase up its centre, with the wards opening from it right and left. These staircases require ventilation, by panes of perforated glass in the window sashes, and by a louvre in the roof.

Each hospital has five wards, differing a little in size, but having regulation accommodation for eight sick each.

The wards are much overcrowded, as will be seen by the following statement, showing the present number of beds, in comparison with what the number ought to be if 1,200 cubic feet were set apart for each bed.

| —— | Total present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| Hospital No. 1, 5 Wards | 40 | 20 | 20 |
| Hospital No. 2, 5 Wards | 40 | 20 | 20 |
| Total - | 80 | 40 | 40 |

There is space for only half the present number of beds in these wards, and hence the hospital has accommodation for no more than forty sick. In this, as in many military hospitals, an orderly sleeps in every second ward with the sick. This practice ought to be discontinued forthwith.

None of the wards are ventilated at present. They have each two fireplaces, one of which only is used. The chimney of the other should be converted into a ventilating shaft, by an opening made into it close to the ceiling, double the section of the chimney; and an inlet, with a perforated zinc cover, ought to be inserted in the side wall, close to the ceiling on each side, to admit fresh air.

The fire-grates in the wards are defective, and waste much heat. They require to be remodelled in the same manner as those for the barrack-rooms.

There is a kitchen for each hospital. One of the kitchens is very defective, and is used as a place for taking meals. The other is better provided with means of cooking. This kitchen, being placed under a sick ward, should be ventilated by a shaft carried up through the roof of the hospital and by glass louvres in the windows.

There are neither water-closets, ablution, nor bath rooms. There are two slipper baths and one shower bath; but accommodation of this kind is not sufficient for a hospital with so many beds.

Water-closets, and a suitable bath and lavatory room, might be constructed over the pack and provision stores, and connected with the building.

The privy at present used by the sick is in the hospital yard, as is also the serjeants' privy. They are not drained, but are placed over cesspits. The exercising ground for convalescents is in the same narrow confined court where these cesspits are placed.

The only way to remedy this defect is to drain the hospital along with the barrack, to construct proper water latrines, and abolish the cesspits.

At present there is no proper water supply. There is a well near the hospital, which is not unfrequently dry, and water has to be carried in by men.

A proper water supply is indispensably necessary, and should be laid on at the same time with the proposed supply for the barrack.

In the same narrow back yard where the privies are placed there is an offensive ash-pit, which ought to be removed, and the hospital refuse collected and taken away under the arrangement already recommended for cleansing the barrack.

There is a wash-house also in the yard. It has no means of drying linen. In so changeable a climate, outdoor drying cannot be depended on, and the linen has to be dried before the ward fires. A drying stove, or closet, ought to be provided.

There is no accommodation for the sick of soldiers' families. Women have to be delivered, and children with small-pox have to be attended in barrack-rooms, for want of hospital room.

This hospital, like so many others we have inspected, is deficient in many of the most needful requirements for the rapid recovery of sick. Its position, construction, and arrangements are much below what they ought to be. It would be a useful building for several barrack purposes, for which additional buildings are required; and it would be very advisable to build a suitable hospital on a better site. It happens that abundance of ground can be obtained close at hand, and we are glad to learn that a proposition for constructing a new hospital has been already made.

*With regard to the present building, we would recommend as follows:—*

1. That the number of beds in the wards be reduced to one half.
2. That the wards be ventilated by an opening into the chimney shaft, and by inlets for air, as recommended. That the staircases be ventilated by louvres through the roof, and by perforated glass panes in the windows; and that the kitchen be ventilated by a shaft through the roof and by glass louvres in the windows. That the ward fire-grates be remodelled.
3. That a bath-room, lavatory, and water-closets be provided, and connected with the hospital.
4. That the hospital be drained; the cesspits in the yard abolished; the privies converted into water latrines; and the ash-pit removed.
5. That the hospital be supplied with water.
6. The wash-house to be furnished with a drying stove.

## III.—CAHIR.

### Cavalry Barracks.

These barracks are well situated, on high ground, about a mile from the town of Cahir. Their position is airy and healthy, and they have abundant natural facilities for drainage. There are a few houses opposite the front gate of the barrack, but otherwise the district is rural. The area within the barrack inclosure is about twelve acres, Irish plantation measure, and consists of light soil over yellow clay.

The river Suir is about a quarter of a mile distant. A fine stream of water, conveyed in pipes, runs through the barrack square. All the buildings are of stone, and were erected between the years 1809 and 1812.

The general plan and arrangement of these barracks are well adapted for health. The men's rooms are separated from the stables. They have the advantage of being only two stories high. They are built in blocks, and the external ventilation is uninterrupted.

There are, in all, six soldiers' houses. Each house is entered by a doorway, from which a short corridor or passage branches right and left. From this passage enter two barrack-rooms, a serjeant's room, and the stairs leading to the rooms above.

All the soldiers' rooms are 32 feet long by 18 wide. The rooms on the ground floor are 11 feet high, and those on the upper floor are 10 feet high. Each room has four windows, two on the opposite sides of the room, so that there are only 18 feet between the opposite windows, an arrangement very favourable for light and ventilation. Each room contains 17 men. There were originally two fireplaces in every barrack-room but one of these has been built up as unnecessary. It has been turned, however, to a very useful purpose, as a ventilating shaft, by having an opening made into it close to the ceiling of the rooms.

All that is wanted to complete the ventilation is to insert two air bricks into the wall close to the ceiling; one air brick on each side of the room, and to cover the opening with a short perforated zinc cornice, to diffuse the air.

The fire-grates of these rooms waste a great amount of heat, and might be advantageously reconstructed, to warm part of the admitted air in winter.

In each house there are two serjeants' rooms, one for each flat. Two of these rooms are used as ablution-rooms for the barracks, an arrangement which is objectionable, because, being within the house, and close to the soldiers' rooms, the damp is apt to be diffused throughout the house, and a serjeant's room is unnecessarily deducted from its legitimate purpose.

The whole barrack has regulation accommodation for 405 non-commissioned officers and men. The following table shows the accommodation in the soldiers' rooms, in comparison with the actual amount, at 600 cubic feet per man :—

| Rooms. | Total Regulation Accommodation | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Lower 11 | 187 | 121 | 66 |
| Upper 12 | 204 | 120 | 84 |
| Total 23 | 391 | 241 | 150 |

The cubic contents of the rooms do not admit of their being divided equally into spaces of 600 cubic feet. We have, therefore, in the table, given rather less than that amount per man, but still it will be seen that there are 150 men too many in the barrack-rooms. It will be necessary, therefore, to remove six men out of each of the ground floor rooms, and seven out of each of the upper flat rooms, leaving eleven men in each of the lower, and ten men in each of the upper rooms, as the maximum number they ought to contain.

The serjeants' rooms have one window, and have each from 1,200 to 1,320 cubic feet of contents. These rooms require an Arnott's silk flap ventilator in the chimney, to improve the ventilation.

The barrack-rooms are lit by candles, and there is no gas at present available, although we are informed by the barrack-master that a proposal has been made for lighting the barrack by gas. It would be very desirable to give effect to this proposal if it can be done, and to introduce a ventilated gas-burner into every room.

There is no day-room for the men.

There is a small school-room fitted up for forty-eight adults, and a library under it, in a detached building, situated at one angle of the barrack square. Both rooms require ventilation by shafts and inlets for air.

As already stated, the present lavatories of these barracks are situated in two serjeants' rooms within the barrack blocks. These rooms were not originally intended for lavatories, but were taken from the construction for that purpose within the last five years. They are provided with slate benches and metal basins, and derive their water supply from a cistern which has been constructed to receive the roof-water of the buildings, and which is placed *under the floor* of the serjeants' room above the lavatory. The arrangement has been very properly objected to by the medical officers, and yet, as we have been informed, it has been contemplated to extend the evil, by misappropriating one of the serjeants'-rooms in each house in a similar manner. Each of the two existing lavatories will only hold twelve men at a time, so that the accommodation is altogether insufficient.

Beside this, there are no baths, and there is no space for them in the present rooms.

We are of opinion that a lavatory and bath-room should be built in a convenient position, not too far from the centre of each block, so as to be reached by the men without unnecessary exposure; that baths, in the proportion of one bath to every 100 men, should be provided, and that the present lavatories should be removed, and the rooms restored to their original use as serjeants' rooms. The main requisites in the position of these lavatories are, that they be near the men's rooms, but not under the same roof, and that, as far as practicable, there should be a covered access to them from the rooms.

There is a wash-house with six boilers, but without any means of drying or getting up linen. It is a long narrow building only 11 feet 8 inches wide, and insufficient for the barrack when fully occupied. Its drainage is defective. It requires a drying stove.

There are two kitchens, with ten boilers, but there are no other means of cooking. A roasting oven of sufficient size should be put up in each kitchen. There is a large ash-pit close to the kitchen; it ought to be removed, and arrangements made for collecting and taking away all the refuse every day.

It is stated that the kitchens are inconveniently situated for the north side of the barrack. They are both at a considerable distance from it, and a separate kitchen, built on the north side, would be a great advantage.

There are neither cleaning sheds nor covered sheds for drill.

There is no sufficient accommodation for pursuing trades. There is one small tailors' shop in the same building as the library and school-room; but being too small for its purpose, it has been temporarily given over to the librarian, and a 17-men room is misappropriated as a tailors' shop. There are the usual armourers' and saddlers' shops.

This barrack is supplied with water from three sources :—1st. There are three wells, from which the water is raised by force pumps into three cisterns, each capable of containing 450 gallons. 2nd. There is a fine stream of water conducted into the yard, for supplying the stables. 3rd. There are two rain-water tanks, supplied from the roofs.

The stream alluded to is brought in at the lower side of the barrack; but we have been informed that, by diverting it, the water could be brought in at the highest level, from whence it could be distributed for use. The roof water might very well be used in the wash-house, if found to be necessary; but to all appearance an ample supply for every purpose might be obtained in the manner pointed out.

The drainage of the barrack is defective. There is no proper outlet at present, and part of the foul water is allowed to stagnate and become very offensive in an uncovered ditch, which runs close outside the boundary wall. The privies have no drainage, except into cesspits. The surface drainage is also conveyed into a cesspit.

The privy cesspits are emptied by contract. They become so offensive at times that peat charcoal has to be used, to diminish the smell.

All the privies, both for officers and men, are at a very inconvenient distance from the quarters.

The latrines require reconstruction. A suitable outlet for the whole drainage ought to be provided, and, if possible, the sewage matter ought to be applied to grass land, at a sufficient distance from the barrack to prevent nuisance.

If this cannot be done, the sewage should be passed into the Suir, after having been deodorized or filtered.

When a proper system of drainage has been completed, all the privies within the barrack should be

reconstructed as water latrines, with means of daily flushing. The new latrines might also be placed more conveniently for the quarters. They should have suitable divisions and half-doors, and be lighted and ventilated from the roof. The urinals ought to have water laid on for cleansing.

There is no accommodation in this barrack for married soldiers. There are 14 non-commissioned officers' rooms. There is one room in the hospital, and one at the school, usually occupied by married non-commissioned officers. When the barracks are fully occupied, there is generally one married woman in every barrack-room.

There is a tolerably good canteen, but the rooms require ventilation.

The guard-room contains eight men by day and twelve men by night, besides prisoners, as there is no lock-up for them. It requires ventilation by a shaft and inlets, and by a remodelled grate to warm the air in winter. A lock-up is much required.

The stables occupy a range of buildings at the side of the parade ground, opposite to the barracks. Each stable holds eight horses placed back to back. They have no window except over the door. Each stable requires four additional windows, and perforated glass panes to be introduced into the windows over the doors.

The riding school requires more light.

*The following are the Sanitary Improvements requisite for these Barracks:—*

1. Reduction of the number of men in each barrack-room from 17 to 11 in the ground floor rooms, and from 71 to 10 in the upper rooms.

2. Additional ventilation of each barrack-room, by two inlets for air to be diffused through perforated zinc, as described. The fire-grates to be remodelled for warming air. Each non-commissioned officer's room to be ventilated by an Arnott's silk flap ventilator introduced into the chimney. Guard-room, school room, and library to be ventilated by shafts and inlets for air, and to have the grates remodelled. Stables to have additional light and ventilation as described.

3. Lavatories and bath-rooms, with baths in the proportion of one bath for every 100 men, with water laid on, to be constructed in a convenient position for the men's rooms. Present lavatories, with the water cisterns belonging to them, to be removed out of the serjeants' rooms.

4. Barrack to be thoroughly drained to a proper outlet. All privies to be reconstructed as water latrines, with drainage and means of flushing, with divisions and half-doors, and to be placed in more convenient localities. Cesspits to be abolished and filled up. Urinals to be improved and supplied with water.

5. The water supply to be improved, by diverting the stream of water as suggested, and providing tanks for its distribution to latrines, lavatories, baths, wash-houses, &c.

6. Wash-house to be enlarged, and supplied with a drying and laundry stove.

7. Kitchens to be provided with roasting ovens.

Lastly. Married quarters and a drill shed are required in this barrack. Workshops should be constructed, and, as there is plenty of land, means should be provided for amusing the men, such as cricket, skittles, a ball court, &c.

### *Hospital, Cahir.*

This is a small hospital, with thirty-three beds. It consists of one block, with a central staircase. There are in all five wards, only one of which is the height of any room in the barracks. The wards are all of different sizes, and are all overcrowded, as will be seen from the following table:—

| Wards. | Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Accommodation. |
|---|---|---|---|
| 1 | 8 | 5 | 3 |
| 2 | 4 | 1 | 3 |
| 3 | 8 | 4 | 4 |
| 4 | 8 | 4 | 4 |
| 5 | 5 | 3 | 2 |
| Total - | 33 | 17 | 16 |

There is barely space for 17 beds in the building. Ward No. 2 has more than space for one bed, but by no means space for two.

Two of the wards have windows on one side, and three have windows on opposite sides.

The wards are not ventilated, but as, in two of the wards, there are two chimneys, one of which is closed, an air shaft could easily be formed out of it, by making a large opening into the chimney close to the ceiling; and fresh air would have to be supplied by the same method as recommended for the barrack rooms. Shafts and inlets would have to be supplied for the other wards. The ward grates should also be remodelled, to warm part of the air in winter.

There is a slipper and shower bath, but there is no proper bath-room, and no lavatory. There are no water-closets, but only an offensive privy, draining into a cesspit. Proper water-closets ought to be provided, connected with the hospital, and placed in the same building as the baths and lavatories. The privies in the yard should be reconstructed as water latrines.

A proper water supply for the hospital ought to be laid on at the same time with the proposed barrack supply.

There is a good exercising yard for convalescents behind the hospital, but it requires covered seats and a verandah.

There is no hospital accommodation for the sick of soldiers' families.

*The following are the Sanitary Improvements required:—*

1. Reduction of number of beds to the extent specified.

2. Ventilation of the wards as recommended, and remodelling of the grates.

3. Outbuilding, having a covered connexion with the wards, to be erected to contain water-closets, bath, and lavatory. Privies in the yard to be converted into water latrines. The cesspit to be abolished, and the whole hospital to be drained along with the barrack.

4. Water supply to be laid on at the same time as that of the barrack.

5. Covered seats and a verandah to be provided for convalescents in the hospital yard.

Lastly. The question of hospital accommodation for the sick of married soldiers' families ought to be considered along with the question of providing quarters for married people. Taking into account the size of the barrack, one ward would probably be enough for such a purpose.

It is evident that, like all other regimental hospitals, this one will have to be extended, to afford the required cubic space per bed; but the question arises in regard to it, whether it might not be used for married quarters, or for barrack-rooms, and another hospital might not be built. This last would be by far the better plan; for even if the present building were extended it would be by no means a good hospital.

## IV.—CLONMEL.

These barracks are situated at the south-eastern extremity of the town of Clonmel, about 300 yards distant from the river Suir, and raised about 20 feet above its level. The situation is open and airy, and there are no nuisances near it, except the smell of the neighbouring gas-works, which at the time of our inspection, pervaded the whole barrack. This nuisance, though, probably, not of sufficient extent to be injurious to health, ought to be prevented, which there is no doubt it can be, to a very large extent, by care in the manufacture.

The total area within the barrack enclosure is 10 acres, 3 roods, 35 perches. The subsoil is clay and sand. The enclosure contains two barracks, one for infantry, with accommodation, by existing regulation, for 484 non-commissioned officers and privates, and one for artillery, with accommodation for 161 men and 108 horses.

Both barracks are constructed of stone, and were built in 1788.

### 1. Infantry Barracks.

The infantry barracks consist of one large building in the middle of the square, and several detached houses which have been appropriated as barrack-rooms, including among them a stable and a riding-house, in the latter of which buildings accommodation has been provided for 110 men.

The barrack proper consists of two houses, B and D, containing 23 men's rooms, with 10 men in each, with an average cubic space of about 370 cubic feet per man, and there are three serjeants' rooms, accommodating in all four men. F house contains three small barrack-rooms. There are four barrack-rooms in G house, one of which contains 25 men, and there are two serjeants' rooms. In H house there are three barrack-rooms, two serjeants' rooms, and the library. As already stated, the riding-house is used for a barrack-room.

All the barrack-rooms are, more or less, overcrowded, and every place that could be converted into additional accommodation has been made use of without much regard to the nature or position of the accommodation provided.

The following table shows the accommodation in each portion of the barrack :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| B House : | | | |
| Nos. 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14 | 120 | 72 | 48 |
| D. House : | | | |
| Nos. 1, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13 | 110 | 66 | 44 |
| F House : | | | |
| Nos. 1, 3, 4 | 21 | 13 | 8 |
| G House : | | | |
| No. 1 | 25 | 18 | 7 |
| Nos. 3, 5, 6 | 33 | 21 | 12 |
| H House : | | | |
| No. 1 | 25 | 19 | 6 |
| No. 4 | 11 | 7 | 4 |
| No. 6 | 21 | 12 | 9 |
| Riding-house | 110 | 107 | 3 |
| Total | 476 | 335 | 141 |

It hence follows that the present regulation accommodation in the soldiers' rooms enables 476 men to be placed in a cubic space sufficient for no more than 335 men, showing an excess of 141 men over the accommodation at 600 cubic feet per man. In addition to this, there are 28 married women accommodated in the men's rooms, who are not counted on the construction, but who require the same cubic space as would be needed by the same number of men.

This latter evil can only be avoided by constructing married quarters.

The rooms in the infantry barrack vary considerably in character. The barrack proper (houses B and D) is three stories high, and each house has a good stone stair dividing it from top to bottom. On each flat this stair gives admission to a short corridor, with windows facing the south, out of which the men's rooms enter. All the rooms, except those at the end of the corridor, have two windows only on one side, and hence they have no thorough ventilation.

The end rooms have the advantage of a window at each end.

There are a few round holes bored through the top of the doors, but, with this exception, there are no means of ventilating any of the rooms.

The amount of light is deficient, especially in the upper rooms. These latter rooms are too low in the ceiling.

The grates are of the old pattern, and waste a large amount of heat. They should be remodelled, with compartments behind for warming the admitted air in winter.

The rooms require to be ventilated by shafts carried from the ceiling to above the roof of the building, and by two inlets for air, one on each side, close to the ceiling. These inlets should be covered with perforated zinc cornices, for diffusing the air within the rooms.

Two rooms in these barracks are misappropriated, as an orderly-room and quartermaster's store.

The barrack-rooms in F house are hardly suitable for their present object, and would be better adapted for married soldiers' quarters.

They require additional light and ventilation.

Part of G house was previously a stable.

The riding school is in bad repair, and it has been contemplated to remove it altogether, and construct married quarters on its site. It appears to us that this question ought to be considered with reference to the extension of barrack accommodation.

The riding school has many obvious disadvantages when used as a barrack-room. It is, in fact, not adapted for such a purpose, but still it stands on the construction for 110 men, who, if it were removed, would have to be either deducted from the construction, or have barracks built for them. Besides this, all the other barrack-rooms are overcrowded. It will be seen by the table already given, that the total accommodation, at 600 cubic feet per man, will only hold 335 men, instead of 476 ; but if the riding school be deducted, the available accommodation, at 600 cubic feet per man, will be sufficient for 228 men, and no more. The prior question, therefore, is to determine what amount of force is to be provided for in these infantry barracks.

The site of the riding school would afford room for extending the barrack accommodation, if it were determined to keep up the present force, and the married quarters might be placed elsewhere.

The outhouses and offices are situated behind the main line of the barrack buildings.

The urinals are placed two and two, with an ash-pit between them. They require to be improved, by being better drained, and by having water laid on.

The privies are of very imperfect construction ; their contents are received into a cesspit ; they have not sufficient light, their ventilation is deficient, and they have neither drainage nor water.

These privies should be reconstructed, and made into water latrines, with means of flushing, and they

should be drained and ventilated. They should have divisions of seats and half-doors, and they should be lighted in the proportion of one and a half square foot of glass per seat.

There is no difficulty about the drainage, for there is an outlet stream, the Boulick, which passes through and under part of the barrack enclosure, and thence into the Suir.

The wash-house is supplied with four boilers, but has neither washing troughs, drying stove, nor gratings to stand on. Its roof ventilation is also deficient.

The cook-houses have boilers, but are not furnished with any other means of cooking. They have a little ventilation in the roof, not sufficient, but which might be improved by a louvred ventilator. One of the cook-houses requires an additional window, and a ventilated roasting oven ought to be put up in each.

There is a good ablution house, with water laid on, and pegs and gratings; there are also drying lines for the towels. It requires additional ventilation at the roof by a louvred turret.

There are no baths.

There is a good library, with gas laid on, but it would be much improved were it practicable to admit more daylight into it.

The barrack is lit externally with gas, but the barrack-rooms only by candles. Ventilated gas-burners should be introduced throughout the entire buildings.

There are no day-rooms for the men.

There is an excellent chapel school, but the schoolmaster's quarter requires additional window space; it is rather dark.

There are no married quarters.

There are neither cleaning-rooms, covered drill shed, nor accommodation for pursuing trades.

The water supply is derived from pumps; the soil is porous, and it is very necessary that the whole barrack enclosure should be thoroughly drained, to prevent the wells becoming polluted by filtration. In carrying out the improved drainage of the latrines, urinals, &c., it will be requisite to erect tanks of sufficient capacity to contain the water supply. The roof water might also be economized, and collected in raised tanks for supplying the latrines, &c.

There is no proper sewerage in these barracks; there is only surface drainage, most of which is disposed of by being led into the Boulick stream, already mentioned. It will be necessary to drain all the latrines by pipe drains, in order that their contents may be flushed out daily.

The surface drainage of the parade ground is stated to be defective, and to require the centre to be raised. This could be easily done, and a few lines of tile drain would keep it dry.

The prison cells are tolerably good, but there is no latrine belonging to them, and the prisoners have to be marched across the barrack yard to the soldiers' privy.

The space where the prisoners break stones requires to be enclosed.

The guard-room is too small for such a barrack; it is dark and unventilated, and has no lock-up.

The present guard-room requires ventilation, by a shaft and inlet, and by a remodelled grate; but it would be better to rebuild it altogether.

### 2. Royal Artillery Barrack, Clonmel.

This barrack is separated from the infantry barrack by a line of stables and by the canteen.

It consists of three sets of rooms of very different character.

Those in C house are good rooms. They are 10 and 11 feet in height. They have each three or four windows, and are light and cheerful. This building occupies one side of a square, the other sides of which are formed by the commanding officer's house, the barrackmaster's house, officers' quarters, and the enclosing wall. It is in three flats, with a wide airy staircase and passage, and the rooms run from front to back, with the windows on opposite sides.

There are, in all, six rooms, with regulation accommodation for 18 men in each.

There are two barrack-rooms at the canteen, one of these is over the bar, and the other is in the rear. They are both objectionable on account of their proximity to the canteen, particularly the one over the bar, which is exposed to the fumes of tobacco and beer from the room below.

There is another very objectionable temporary barrack-room made out of the straw store. It is intended for 20 men, and is certainly not fit for the purpose.

The following table shows the present regulation accommodation, and what it would be at 600 cubic feet per man :—

| Rooms. | Total Regulation Accommodation. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Canteen, over bar | 14 | 9 | 5 |
| Rear of Canteen - | 19 | 14 | 5 |
| C House, 1, 2, 3, 4 | 72 | 48 | 24 |
| ,, 5, 6, - | 36 | 22 | 14 |
| Straw Store (temporary) - - | 20 | 13 | 7 |
| Total - - | 161 | 106 | 55 |

Two of the rooms at least, the one over the canteen bar and the straw store, ought to be deducted entirely from the construction. The remaining rooms, under the present regulation, would accommodate 127 men. But if 600 cubic feet per man be allowed, these remaining rooms would accommodate 84 men, and no more.

None of the rooms are ventilated. They should each have a shaft carried up from the ceiling above the roof, with inlets for air over the windows, with perforated zinc cornices and regulating valves.

The grates might also be remodelled, to warm a portion of the admitted air during winter.

The cook-house has boilers, but it has no other means of cooking. It requires a roasting oven, and also roof ventilation.

The ablution-rooms have water laid on. They require more pegs.

There are no baths.

There is no women's wash-house.

There are no married quarters.

The drinking water is obtained from pumps. A rain-water tank was being constructed at the time of our inspection.

The stables are in the rear of the barracks, and detached from the men's quarters. They are very good.

The privies have the usual defects. They ought to be reconstructed as water latrines, with means of flushing. The barrackmaster suggests that they might be removed, and erected on a more eligible site.

The ash-pit should be removed, and arrangements made for collecting and taking away the barrack refuse every day.

There is a fives court, it requires flagging; but there is neither day-room, covered shed for drill, nor accommodation for trades.

The Boulick passes under the buildings of the artillery barrack square, so that there are ample facilities for drainage.

This barrack is lit by candles. Gas ought to be introduced.

We have sufficiently indicated the nature of the improvements required in these barracks. As already

stated, certain of them, requiring the evacuation of rooms unfit for use, and the reduction of numbers in the remaining rooms, have to be considered with reference to the amount of barrack accommodation required at Clonmel for military purposes. If the present force is to be kept up, it is quite clear that additional barrack accommodation for the Royal Artillery will also have to be provided.

*The following are the Sanitary Improvements required in both Cavalry and Infantry Barracks :—*

1. Reduction of numbers in the barrack-rooms of both barracks, to the extent specified.

2. Ventilation of the barrack-rooms in both barracks, by shafts and inlets for air, and by remodelling the grates.

3. Drainage to be constructed from the privies of both barracks, and all cesspits to be abolished. Present privies to be reconstructed as water latrines, with water tanks and means of flushing. Seats to be divided, and to have half-doors. Light to be provided in the proportion of one and a half square foot per seat. Roof ventilation by louvres. Urinals to be supplied with water.

4. Cook-houses in both barracks to be supplied with roasting ovens, and to be ventilated at the roof by louvres. An additional window is required in one of the infantry cook-houses.

5. Wash-house of the infantry barracks to have proper washing troughs, drying and laundry stove, and gratings to stand on provided. Its ventilation to be improved by a louvre in the roof. A similar wash-house to be provided for the artillery barrack, or infantry wash-house to be made sufficient for both barracks.

6. Ablution-rooms of both barracks require additional pegs, and additional roof ventilation.

7. A bath-room is required for both barracks, with one bath for every 100 men.

8. A ventilated gas-burner should be introduced into every barrack-room of both barracks.

9. Day-rooms and covered drill-sheds are required for the men.

10. The water supply to be improved, as described.

11. A water latrine and water urinal to be provided for the prison cells.

12. Both guard-rooms to be better lighted, by additional window space, and to be ventilated at the roof.

13. Ash-pits to be abolished, and daily collection and removal of refuse substituted.

Besides these requirements for health, the barracks have need of married quarters, workshops, and cleaning-rooms ; and the parade ground might be advantageously improved, as described.

### *Clonmel Barrack Hospital.*

The hospital stands in an enclosure behind the artillery barracks, in such a position that the prevailing winds blow over the artillery stables before reaching it.

The hospital consists of a basement and two flats. In the basement are placed the kitchen, bath-room, pack store, and bedding store.

The kitchen would be much improved by a new cooking range, and by a ventilating shaft carried above the roof of the building.

The bath-room has no baths ; it is damp. A new bath-room is required, above the level of the ground. The pack and bedding store ought also to be removed from their present position.

The first floor has two end wards, connected by an inside corridor, out of which other wards and offices enter. The arrangement on the second floor is similar. Some wards have windows only on one side, and some on two sides.

The following table shows the present ward accommodation, in comparison with what it would be at 1,200 cubic feet per bed :—

| Wards. | Total Present Number of Beds. | Total Number of Beds. at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1, 2, 3 | 24 | 9 | 15 |
| 4, 5, 6 | 30 | 12 | 18 |
| Total - | 54 | 21 | 33 |

There is a deficiency, therefore, of space for 33 beds, and the hospital can accommodate no more than 21 patients. To do this it will be necessary to give less than 1,200 cubic feet per bed.

None of the rooms are ventilated. They require shafts carried up from the ceilings to above the roof, and inlets for air. Remodelled grates ought also to be introduced for warming the admitted air in winter.

There are three water-closets, supplied with water by a force-pump. They were not in good repair. There are no orderlies' rooms. The wards are lit with candles. Gas should be introduced instead.

There is a privy in the yard, which empties itself into an ash-pit. This privy ought to be drained, and reconstructed as a water latrine, and the ash-pit removed. The hospital refuse ought to be taken away daily.

*We would recommend, for the Improvement of this Hospital :—*

1. Reduction of number of beds to the extent stated above.

2. Ventilation of all the wards by shafts and inlets for air, and by remodelled grates. Ventilation of the kitchen by an air-shaft.

3. A proper bath-room to be built, with a bath, and hot and cold water laid on. A lavatory should also be provided in the same room.

4. Repair of the water-closets. Privy to be drained and converted into a water latrine.

5. The ash-pit to be removed, and the hospital refuse to be collected and removed daily.

6. Each ward, and the passages, kitchen, &c., to be lighted by ventilated gas-burners.

Lastly, proper grates ought to be provided, and the hospital extended to afford the requisite space for the sick, and also for sick wives and children of soldiers.

## V.—WATERFORD.

There are two barracks in the city of Waterford, one for infantry, and the other for artillery. They both occupy elevated and comparatively open positions close to each other. There are houses and cabins near the boundary walls, but the neighbourhood is not a populous one.

### 1. Infantry Barracks.

These barracks are situated on high ground, at the outskirts of the city, and were built about the year 1799. They consist of three detached ranges, of rubble masonry, occupying three sides of a square.

Two of these ranges, on the right and left sides of the entrance gate, contain the soldiers' quarters.

The third range, opposite the gate, contains the officers' quarters.

The barrack stores, barrack-master's house, guard-room, cell, and gate, complete the fourth side of the square. Behind each range of soldiers' rooms, close to the boundary wall, are placed the outhouses, consisting of lavatories, wash-houses, kitchens, urinals,

latrines, and ash-pits; and behind the officers' quarters is the hospital.

The area within the barrack enclosure is about five acres. It is elevated 110 feet above the sea level, and is 600 yards from the river Suir. The subsoil is rocky.

The arrangement of the buildings is a good one for ensuring external ventilation.

The barrack square, and the ground behind the ranges, is rolled and surface drained; and there is a narrow strip of boulder stone pavement, intended for a footpath, extending along the front of each range.

The guttering is outside this pavement. It is tolerably good and even in front, but behind the ranges it is defective.

The material used is a bad one for paving. It is next to impossible to secure a good self-draining and clean surface by it, and when it is applied in any way for the formation of gutters it is of very little use.

In the present case the surface draining and guttering behind the ranges admits of considerable improvement. The gutters are not well formed. They are too close to the back wall of the barrack-rooms. Foul water was lying in them here and there at the time of our inspection. Moreover, the roof water is received into iron tanks, close to the corners of which these gutters pass, so as to endanger the purity of the water. The ground also slopes, not away from the walls, as it ought to do, but towards the walls, so that the surface drainage, part of which proceeds from the outhouses, is brought towards the buildings, instead of running from them.

These defects should be remedied:—1. By improving the levels behind the ranges. 2. By taking up the existing boulder stone pavement, and laying down a flagged footpath, with properly formed gutters, along each side of the ranges.

As a general principle, applicable to all barracks, we are of opinion that flagged footways ought to be carried along the front of the ranges at least; that the best square setts should be alone used for paving the ground close to the walls in places where flagging is not required, and that the guttering should be of the best construction.

These improvements, if universally introduced, would facilitate greatly the surface drainage, besides ensuring dryness of the subsoil close to the walls, and rendering surface cleansing more easy.

The barrack-rooms are contained in three houses in each range, six houses in all. The houses are two stories in height, an excellent point in their structure. In the centre of each house is a staircase and passage, the latter passing right through the house, a form of construction which aids materially the internal ventilation. Each house contains four barrack-rooms, two on each flat. There are in all 24 rooms, 22 of which are occupied as soldiers' rooms. These rooms are of one uniform size. They are 32 feet long, 20 feet broad, and 10 feet high, and contain 6,400 cubic feet of space. The regulation number of men per room varies from 16 to 18, with a cubic space varying from 355 to 400 cubic feet per man. At the time of our inspection, the rooms were occupied by numbers less than those permitted by the regulations.

The following table shows the total present regulation accommodation, and what it would be at about 600 cubic feet per man:—

| Occupied Rooms. | Total Regulation Accommodation | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 22 | 384 | 242 | 142 |

By reducing the numbers to 11 men per room, an amount of cubic space somewhat less than 600 cubic feet per man would be given for the inmates, and this would necessitate the reduction of the total accommodation from 384 to 242 men.

Each barrack-room has three windows in front and one window at the back. There were originally two fireplaces per room, one at each end, but one of these fireplaces was built up, as unnecessary. One of the outlets for foul air at night was thus closed. Quite recently, however, immediately before our inspection, an opening was made into the chimney, close to the ceiling, and a grating placed over it. The disused chimney has thus been converted into a ventilating shaft, on the same principle as the shafts recommended by us to be introduced into other barracks. The arrangement is not, however, sufficient, because the holes in the grating are too small, and no inlets for fresh air have been provided.

To render the ventilation sufficient, it will be necessary to enlarge the openings in the grating, or to increase their number to about double the full sectional area of the chimney, and to introduce two inlets for fresh air, one on each side of the room, close to the ceiling, the openings to be covered with a perforated zinc cornice to diffuse the air, and to have valves for regulating the current. In order to obtain the full effect of the ventilation, it will be necessary to remodel the fire-grates and to introduce arrangements behind each grate for warming the inflowing air in a fire-brick chamber during winter. This arrangement will permit not only of abundance of air being admitted, but we anticipate a large saving in fuel from its adoption.

The guard-room is very small for the number of men. It has an Arnott's ventilator into the chimney, but requires, in addition, the grate to be reconstructed, so as to warm the inflowing air. The number of men in the guard-room should be reduced, or the guard-room enlarged.

These barracks are lit by candles, although gas can be obtained. We would recommend that a properly ventilated gas-burner should be introduced into every barrack-room.

There is no day-room for the men.

There is a school-room and library, both requiring ventilation by shafts and inlets for air, like the soldiers' rooms.

There are two lavatories, with benches, water-pipes, basins, &c., but no water. The pump was out of order, and there was no tank, although it was stated that one was about to be supplied. The places smelt very strongly, apparently from want of ventilation and want of water to keep every part sweet. These lavatories require additional light from the roof and additional ventilation, and the pegs should be removed from over the basins to the back wall.

There are no baths. Three ought to be provided, and water laid on constantly to them.

There is one women's wash-house built against the boundary wall. It is supplied with boilers and benches, but it has neither fixed tubs nor gratings to stand on. It is drained by a gully in the floor, but the contents of the wash-tubs find their way, nevertheless, down the slope between the wash-house and the barrack houses, and lodge in the gutters there, close to the walls. This defect should be remedied.

There is no drying stove to the wash-house, nor any means of getting up linen. A drying-room ought to be attached to every barrack and hospital, especially in such a moist and changeable climate as that of Ireland. Much sickness would be saved in this way, for at present it is hardly possible to ensure that either the soldiers or the sick have dry linen.

There is no water laid on to the wash-house, but there is a pump outside from which water is obtained.

There are four cook-houses, with four boilers in each. There are no means of cooking meat except by boiling.

Two of these cook-houses (one on each side) might

very well have two boilers removed, and proper ventilated roasting ovens substituted. The louvres in the roof of these houses require to be repaired.

There are two cleaning sheds in the rear of the soldiers' barracks.

There is no covered drill shed. One ought to be provided.

Workshops are also required, for there are none except an armourer's shop.

The water supply of these barracks is obtained from three pumps, and two underground fire tanks which receive the roof water. Each tank has 10,000 gallons of cubic capacity.

The water supply is defective at present, and when the improved drainage we are about to suggest has been introduced it will be found totally inadequate. The first question, therefore, is to determine how the water supply is to be increased. There is a town water supply, but it is considered doubtful whether it would reach so high a level as these barracks.

This should be inquired into, and possibly some arrangement might be entered into for introducing the water. If the water would not rise sufficiently high, it might be made to do so by pumping arrangements, such as are used for supplying Shorncliffe camp from the mains of the Folkestone Waterworks, from which the water is thrown up by steam power. There are two barracks, those of the artillery and infantry, close to each other, and they might both have water introduced on the same plan. If it is found to be impracticable to supply these barracks by gravitation or by pumping from the mains, the only other alternative is to improve the wells in the barrack yards, to erect better pumping machinery, to put up large enough tanks, and to make the supply of these tanks a part of the every day barrack work. All the water for barrack purposes should be drawn from the tank, and laid on over the buildings, and the present unsatisfactory system of supply should be discontinued.

The barrack square and buildings are surface drained, but there is no proper sewerage. The sinks are connected with the city sewers.

There is one exceedingly offensive latrine for the men, situated at one end of the yard. It is simply a privy connected with a cesspit, which is emptied by a contractor, when required by the barrackmaster.

There are other equally offensive privies connected with other parts of the barrack buildings.

The whole of these should be reconstructed, and drained. The privies should be converted into water latrines, with suitable divisions of seats and half-doors.

They should be ventilated and lighted from the roof. Water should always stand in the latrine tanks, and they should be flushed out once a day at least.

The ash-pits are close to the urinals, which appear to be drained into them. The contents of the urine tubs are disposed of in the same manner.

The ash-pits should be abolished, and the barrack refuse collected and removed in iron carts every day. The urinals should be drained and supplied with water.

There is no separate accommodation for married people, and eleven women live in men's rooms.

The barracks are stated to be deficient in the following accommodation :—

A serjeants' mess room and kitchen, a quartermaster's store, a schoolmaster's quarter, an additional staff serjeant's quarter, a serjeants' latrine, and iron shelves in four barrack-rooms.

*The following are the requisite Sanitary Improvements :—*

1. Reduction of numbers in the barrack rooms, to the extent stated above.

2. Improvement of the ventilation and warming in all the barrack rooms, in the manner stated.

3. To improve the ventilation of the school-room, to enlarge the guard-room, and improve the grate in the guard-room, to warm the admitted air.

4. To relay the surface paving, and improve the surface draining and guttering, in the manner pointed out.

5. To improve the water supply, in one of the modes pointed out.

6. To reconstruct all the privies as water latrines, with water tanks, and means of flushing and drainage, to provide divisions of seats and half-doors, and to light and ventilate the buildings from the roof, to drain the urinals, and supply them with water for flushing.

7. To improve the drainage of the wash-house, and to provide a drying stove.

8. Ventilated roasting ovens to be provided in two of the cook-houses.

9. To introduce gas, with ventilated burners, into the barrack-rooms.

10. To ventilate and provide more light for the lavatories, and to provide three baths, with water laid on, also to remove the pegs from over the basins, and replace them on the back wall.

11. To abolish the ash-pits, and provide iron carts for the daily collection and removal of the barrack refuse.

Lastly, a covered drill shed, additional workshops, and a suitable proportion of married quarters should be provided.

*Infantry Hospital.*

The hospital belonging to Waterford infantry barracks is constructed on a small and inconvenient model, common to most regimental hospitals. It is three stories high, and has its wards and offices on two sides of a central staircase.

The ground-floor of the building is occupied by the surgery, serjeant's room, and offices. The staircase is of wood, and a ward opens from it to the right and left on the two upper flats.

Each ward has two windows in front and one at the back, and contains six beds. The whole hospital, therefore, accommodates 24 sick.

The wards are all of a size ; they are 17 feet long, 16 feet wide, and only 10 feet high, and they give 453 cubic feet per bed, and are very much overcrowded.

The following table shows the accommodation :—

| Wards. | Total Regulation Number of Beds. | Total Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Space. |
|---|---|---|---|
| 4 | 24 | 8 | 16 |

The wards are much too small to accommodate three beds each. With two beds each they give somewhat more than 1,200 cubic feet per bed. They have no means of ventilation, except a small Arnott's valve into the chimney, which is quite inadequate for the renewal of the air.

Besides the radically defective construction of this hospital it is deficient in the most needful requirements. It has no water-closet. There is, instead, a most offensive privy in the yard, to reach which, the sick have to walk outside, in all states of the weather.

It has no lavatory, and the sick have to wash in the wards.

It has no bath ; but there is a ruinous little building, like a cupboard, at one corner of the yard, in which is a useless shower bath.

It is not supplied with water.

There is a pump in front of the hospital, but it was out of order, and the water had to be obtained from another pump behind the soldiers' barracks.

The kitchen arrangements are very defective.

A new cooking range with oven, boiler, hot plate, &c., is required.

There is no place for convalescents to walk in, except a small, narrow, confined, badly paved front yard, on one side of which is situated the dead-house.

There is no room for hospital attendants; no provision store; and the dispensary is small and inconvenient.

The defects of this hospital are so serious, that were it possible to rebuild it at once, such would be the best course to pursue.

Unfortunately, its defects are not singular, and the whole question of these regimental hospitals requires consideration, with the view to making more suitable provision for the sick than they afford.

We shall, therefore, limit our recommendations for improvements to those points which are barely necessary for health.

The wards are overcrowded, and must have their numbers reduced.

Each ward must be ventilated by a shaft carried from the ceiling to above the roof, and by an inlet for air on each side the ward, similar to those recommended for the barrack-rooms. The grates should at the same time be remodelled, to warm part of the inflowing air.

The water supply of the hospital ought to be improved, along with that of the barrack; and it should have water laid on.

The present privy should be converted into a water latrine, with means of flushing; and a water-closet should be provided in a building connected with the wards, which should also contain a bath-room, with hot and cold water laid on, and a lavatory for the sick.

The kitchen ought to be provided with a proper cooking range.

It would be most desirable also, if space could be obtained for convalescents taking exercise. If they must walk in the hospital yard, it ought to flagged, and a covered seat provided.

*The immediate Improvements we would recommend are as follows:—*

1. To reduce the number of beds to give 1,200 cubic feet to each.
2. To ventilate each ward by a shaft and inlets, and to remodel the grate.
3. To lay on water to the hospital.
4. To construct a water-closet for the sick, and to convert the present privy into a water latrine.
5. To construct a bath-room and lavatory.
6. To improve the kitchen arrangements.
7. To provide accommodation for convalescents exercising.

### 2. Royal Artillery Barrack.

This is a small barrack, situated at a short distance from the infantry barrack. It is of rubble masonry, and was built about 1805. It consists of a single house, occupying the middle of a large square, 2½ acres in area, surrounded by stables, offices, stores, &c. The barrack consists of three stories and a basement, and is divided in the middle by a staircase and passages, out of which the rooms open.

There are in all eight rooms, with 15 men to each; but two of these rooms are in the basement, which is almost entirely below the level of the ground. These two rooms are quite unfit for barrack-rooms, and ought to be forthwith evacuated.

The accommodation in the remaining six rooms is as follows:—

| Rooms. | Present Regulation Number of Men. | Number at 600 Cubic Feet each. | Deficiency in Men's Accommodation. |
|---|---|---|---|
| 6 | 90 | 54 | 36 |

The total men in barracks amount to 120. Thirty of these men are lodged in the basement, and ought to be at once removed. The six rooms above will accommodate nine men each, at somewhat less than 600 cubic feet per man, so that the available accommodation in the building is sufficient for no more than 54 men.

The barrack-rooms run from front to back of the building, and have each three windows. They have no ventilation, and require shafts and inlets of the usual construction, along with remodelled grates, for heating a portion of the admitted air in winter.

The whole barrack is lit by candles, although gas could be easily obtained. There is neither day-room for the men, school-room, nor library. There are neither lavatories nor baths.

There is a small miserable wash-house, with boilers, but without other conveniences for washing and drying linen.

There are two cook-houses, with four boilers in one and three in the other, but there are no other means of cooking. A proper roasting oven ought to be put up.

There is no cleaning-room, nor covered drill shed, and the only workshop is a tailor's shop, which is dark and unventilated.

The water supply is derived from two iron pumps, and there is a fire tank capable of containing 10,000 gallons.

The privies are in a very offensive condition. They are mere cesspits, which are emptied by a contractor on the requisition of the barrackmaster. The whole drainage is defective, and is led into a cesspit in rear of the stables. A main drain belonging to the city passes near the barracks. The barrack drainage should be reconstructed and connected with it, and all cesspits ought to be abolished. The privies require to be reconstructed as water latrines, with suitable drainage and means of flushing. They ought to have divisions of seats and half-doors; they should be ventilated by louvres in the roof, and lighted, in the proportion of 1½ square feet of glass per seat, through the roof.

The following deficiencies in the construction have also been reported to us:—

A straw store. A barrack store. A serjeants' mess-room, kitchen, and privy. Additional staff-serjeants' quarters, and a fuel yard.

The total available accommodation in the barrack, at 600 cubic feet per man, being only for 54 men, it is clear that before these additions are determined on, the question of enlarging the barrack would have to be entertained.

The guard-room requires ventilation through the roof, and a remodelled grate for warming the admitted air.

*The Sanitary Improvements required are as follows:—*

1. Evacuation of the barrack-rooms in the basement, and the removal of six men out of each of the remaining barrack-rooms.
2. Ventilation of each barrack-room by shafts and inlets for air. Ventilation of the guard-room through the roof, and remodelling the grates in the barrack-rooms and guard-room as described. Tailors' shop to be similarly ventilated.

Gas to be laid on, and a ventilated gas-burner to be introduced into each barrack-room and into the kitchens.

3. The barrack to be sewered, and all cesspits to be abolished, and all drains properly trapped.

Privies to be reconstructed as water latrines, with drainage into the sewers and means of flushing. Light to be provided for the privies, in the proportion of 1½ square feet of glass per seat. Ventilation at the roof to be provided, and divisions of seats, and half-doors.

4. A lavatory and bath-room to be constructed, with one bath, and water laid on.

5. Better accommodation for washing linen, and a drying and laundry stove to be provided.

6. Cook-houses to be supplied with ventilated roasting ovens.

7. A covered drill shed and cleaning shed to be provided.

8. Water supply to be improved, to admit of its being constantly laid on to the privies, lavatory, and bath-room, kitchens, wash-houses, hospital, &c.

Lastly, we would recommend the whole question, as regards this barrack, to be considered with reference to extending the accommodation. The present stables are excellent examples of good and healthy stable construction, and the barrack accommodation should be extended and improved, so as to make the whole establishment as complete as possible. We were informed that the requisite extent of land could be easily obtained for such a purpose.

*Royal Artillery Hospital.*

This hospital is situated at the lower side of the barrack square, in a corner, at the end of the stables. It is a small, narrow building, with a deep underground basement, and altogether unsuitable for sick. Its situation is bad, and its whole construction so defective that the best thing to do would be to evacuate it, and to build another hospital.

There are two small wards, with six beds in each. These wards are overcrowded, and defectively ventilated.

There is no room for either hospital-serjeant or orderly.

There is no water-closet, but only a most offensive privy.

The surgery is detached from the hospital, and there is an arched basement below it, intended for a dead-house.

The kitchen is not used.

There is no bath-room or lavatory.

It would be inadvisable to incur much cost on such a building ; but as it must be used for the present, it might be somewhat improved by carrying out the following recommendations :—

1. Inserting a large-sized Arnott's silk flap ventilator into each chimney, and a perforated glass pane into the top row of each window.

2. Removing as many beds out of each ward as will allow 1,200 cubic feet for each of the remaining beds.

3. Constructing a proper water-closet.

These improvements could be carried out immediately ; but, as already stated, the hospital should be rebuilt in a better position. It would be advisable, for the sake of economy, to construct one hospital for the infantry and artillery barracks, and turn both the present buildings to other uses.

SIDNEY HERBERT.
JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission, February 15, 1859.*

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# CORK DISTRICT.

SIR,

IN conformity with our instructions, we have inspected and made inquiry into the condition of the barracks and hospitals at the following stations within Cork District :—

I. Cork.
II. Cork Harbour.
III. Bandon and Kinsale.
IV. Tralee.
V. Buttevant.
VI. Mallow.
VII. Fermoy.

The results of our examination, with the sanitary improvements we have the honour to recommend, are given in the following Report.

## I.—CORK.

We have visited the following barracks and hospitals in Cork and its immediate vicinity :—

1. Cork cavalry and infantry barrack.
2. Cat Fort, infantry.
3. Fort Elizabeth, infantry.
4. Ballincollig, Royal artillery.

### 1. CORK CAVALRY AND INFANTRY BARRACKS.

These barracks are of stone, and were erected in the year 1800. They are situated in an open district in the suburbs of Cork, about seven-eighths of a mile from the river Lee, and about 290 feet above the sea level. The barrack enclosure contains an area of 24 acres and 10 perches. The subsoil is rocky, and the means of natural drainage ample.

The barrack buildings form three sides of a square, with the angles open ; and behind the square are ranges of buildings running parallel with the central block, also used as soldiers' quarters. Behind these ranges are the lavatories, wash-houses, cook-houses, &c., and behind these again are the latrines. The cavalry stables are situated on the west side of the barracks, and at no great distance from them is the hospital.

The barrack buildings are three stories high. They consist of 24 houses, with six rooms in each, and a central staircase of stone, with the barrack-rooms opening out of it on either side. The rooms are of two sizes : those in the cavalry barracks are 23 feet long, 16 feet 11 inches wide, and 11 feet high, and have regulation accommodation for nine men each ; the rooms in the infantry barrack are 30 feet 5 inches long, 20 feet wide, and 11 feet high, and contain 15 men each.

All these rooms are considerably overcrowded, as will be seen by the following table of the accommodation :—

| Rooms. | Total Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Cavalry 19 | 171 | 133 | 38 |
| Infantry 117 | 1,755 | 1,287 | 468 |
| Total - | 1,926 | 1,420 | 506 |

It will be necessary, in order to give 600 cubic feet per man, to remove two men out of each of the cavalry rooms, and four men out of each of the infantry rooms, which will give the required amount of cubic space almost exactly. When these reductions are made, the total accommodation in the barrack will be sufficient for 1,420 men, and 506 men is the number for whom additional barrack accommodation will be required.

Each of the infantry rooms has four windows, two on either side, and each of the cavalry rooms has three windows.

The lower panes in some of the windows are filled with wood instead of glass, on account of breakage, from the men using the flat window sill as a shelf. This interferes with the light, and it would be a much better plan to introduce the sloping cast-iron sill, and remove the woodwork.

There is one fire-grate of the old imperfect form in each room. All the grates ought to be reconstructed, to save fuel and warm part of the air for ventilation in winter.

None of the rooms are efficiently ventilated at present; some of the upper rooms have openings through the ceiling into the roof, and in some of the houses the foul air is allowed to escape by raised ridge tiles. This method of ventilation is not sufficient, and it will be necessary to introduce a ventilating shaft at the ceiling of each room, and to carry it up above the roof of the buildings; an air-brick ought to be inserted near the ceiling between the windows on each side of the room, and covered by a perforated zinc cornice for diffusing the air.

The ventilation of the staircases requires improvement by louvres in the roof, and by perforated glass panes in the stair windows.

All the barrack-rooms are lit by candles, although there is gas within the barrack precincts. We would recommend that a ventilated gas-burner be introduced in every room.

There are no day-rooms for the men, a defect in no way compensated for by the state of the canteen, which is small and inconvenient. Its tap-room is gloomy and unventilated, and could be very little improved without rebuilding the whole on a better plan; it would be preferable, however, to provide suitable day-rooms for the men to resort to. The canteen tap-room should be ventilated by a silk flap ventilator into the chimney, and by perforated glass panes in the windows.

The infant school-room requires ventilation by a silk flap ventilator into the chimney, and by perforated glass panes in the windows.

There is a library and reading-room, but they are too small for the barracks; they ought to be ventilated in the same manner.

There are good ablution houses, with 217 basins.

There are no baths; it will be necessary to construct a bath-house, with one bath for every 100 men, and water laid on.

Notwithstanding the number of troops in these barracks, there is no laundry for getting up linen. There are only two small women's wash-houses, with two boilers in each, totally insufficient for their object. A proper laundry is much required. In the meantime each wash-house should have a drying stove placed in it.

There is no accommodation for married non-commissioned officers or soldiers. There are 91 women located in soldiers' barrack-rooms, for whom there is no other accommodation.

One of the barrack-rooms is used as a serjeants' mess-room; it requires ventilation like the other rooms.

There are eight soldiers' cook-houses with boilers, but with no other means of cooking. A roasting oven ought to be provided for each cook-house. The lighting and ventilating are both defective in all of these cook-houses. Additional windows or skylights are required, and louvres in the roofs.

There are no cleaning-rooms, but an old shed is used for this purpose.

This shed is also used for protecting baggage before the embarkation of troops, and for serving out rations.

A more serious want is that of a covered shed for drill and muster. Such a shed is the more required in these barracks, on account of the frequent change of troops, as well as to afford shelter in wet weather for troops arriving, while their quarters are being taken over.

There are three tailors' shops, two armourers' shops, and two smiths' forges.

They all require ventilation.

The water supply is derived from four wells and six tanks; the roof water is collected and used; the water supply is stated to be always sufficient, but it may not be so when the drainage works are carried out.

There is a sufficiency of privies, but they are all of bad construction, placed over cesspits, and very offensive.

There is plenty of fall for the barrack drainage, and an outlet might be obtained either into the river, or the sewage might be conveyed a sufficient distance into the neighbouring country, and applied to grass land. When the barracks are properly drained, the privies should be converted into water latrines, with divisions of seats and half-doors, and water-closets should be provided for the officers' quarters. All the cesspits ought, at the same time, to be done away with.

The urinals are not of good construction. They ought to be improved, and supplied with water for cleansing.

The ash-pits of these barracks are open to the usual objections; they ought to be done away with, and all the barrack refuse ought to be collected and removed daily in iron carts.

Behind the barrack ranges there are six huts of the usual construction, with 25 men in each; they are ventilated, in the usual manner, through the roof; they are overcrowded, and the regulation number of men should be reduced from 25 to 20 in each hut.

There are seven guard-rooms connected with these barracks; one on the north side is a very good one, erected on General Mansel's plan, with a lock-up separated from the guard by an iron grated door.

It is ventilated into the space under the roof by a number of openings; the other guard-rooms are not so well ventilated.

It is better to carry a shaft from the ceiling to above the roof, and to provide an inlet; and this we would advise to be done with the unventilated guard-rooms.

All of these guard-rooms might be materially improved, by having the grates remodelled to save fuel and to warm part of the admitted air.

The cells at the main guard require more ventilation; a water latrine is also required.

There is an excellent provost establishment, kept in very good condition, but its drainage arrangements have the same defects as those of the barracks. It has an open privy and cesspit; both ought to be removed, and a properly drained water latrine substituted.

The provost serjeant's quarters are very small; there are seven inmates, who sleep in one small unventilated bed-room; additional accommodation ought to be provided, and it could be very easily done.

Some of the stores in these barracks are defective; the barrackmaster's straw barn is close to his other stores, and if it caught fire the whole would probably be burnt; the downstairs stores are too dark; the wood store is open to the weather, and the weighing machine is in the open air.

*The Sanitary Improvements required for these Barracks are as follows:—*

1. Reduction of the numbers of men in each barrack-room and hut to the extent specified.

2. Ventilation of all the barrack-rooms, serjeants' mess-room, and workshops, by shafts and inlets for air; ventilation of unventilated guard-rooms in a similar manner; ventilation of the infants' school, library, reading-room and canteen, by silk flap ventilators into the chimney, and by perforated glass panes in the windows; ventilation of the barrack staircases by shafts from the top of the staircase, carried above the roof, and by perforated glass panes in the windows; additional ventilation in the lock-up cells; all the barrack-room and guard-room grates to be remodelled, to save heat and to warm part of the admitted air in winter.

3. A ventilated gas-burner to be introduced into every barrack-room.

4. Day-rooms to be provided for the mne.

5. A bath-house to be built, with bath accommoda-

tion in the proportion of one bath for every 100 men, and water laid on.

6. A suitable laundry, with means of getting up linen, to be constructed, and till this is done each wash-house to be provided with a drying stove.

7. Each cook-house to be provided with a roasting oven, and to have additional light by windows or sky-lights, and a louvre for ventilation in the roof.

8. Covered drill-sheds to be erected.

9. Water supply to be improved in connection with the barrack drainage ; and water to be laid on for latrines, baths, urinals, &c.

10. All privies in the barracks to be reconstructed as water latrines, with divisions of seats, half-doors, light, and ventilation ; the water latrines to be drained, and the sewage conveyed to an outlet in one of the ways suggested ; all cesspits within the barrack precincts to be abolished ; a water latrine to be provided at the main guard ; officers' quarters to be provided with water-closets ; urinals to be improved, and supplied with water.

11. Ash-pits to be removed, and the barrack refuse to be collected and taken away daily in iron carts.

Lastly, married quarters are much required in these barracks. When they are built, the new laundry suggested might be built along with them. The provost-serjeant's quarters should also be extended.

### *Cork Barrack Hospital.*

The hospital belonging to these barracks is situated on the north-west side of the inclosure, and directly to the windward of it are the cavalry stables and manure heaps, the effluvia from which are carried to the hospital by the south winds. It consists of an old building, forming the centre, and of two wings of more recent and better construction. The central building, and one of the wings, are appropriated as regimental hospitals, and the other wing is used as a general hospital. The entrances to these different portions of the building are all connected by covered passages running along the front of the hospital. The access to the wards in the wings is by stone staircases, and the wards of the old hospital are reached by tortuous well staircases of wood. All the staircases require to be ventilated. There are 20 wards, with regulation space for 164 beds. The following table will show that all the wards are considerably overcrowded :—

| Wards. | Total Regulation Number of Beds. | Total Accommodation at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| A and E Hospital : | | | |
| 2 Lower - | 26 | 14 | 12 |
| 2 Upper - | 26 | 14 | 12 |
| 2 Lower - | 20 | 10 | 10 |
| 2 Upper - | 20 | 10 | 10 |
| B, C, and D Hospital : | | | |
| 6 Lower - | 36 | 18 | 18 |
| 6 Upper - | 36 | 24 | 12 |
| Total 20 - - | 164 | 90 | 74 |

The dimensions of the wards render it impossible to divide the space equally into portions of 1,200 cubic feet. In the majority of instances, in the above table, we have allotted less than 1,200, to save space as much as possible, and yet the building cannot contain more than 90 beds. The reduction of numbers in the wards will have to be carried out as follows :—

In each of the two upper and two lower wards of A hospital first in the table, the number of beds per ward will have to be reduced from 13 to seven.

In each of the two upper and two lower wards of E hospital, the number of beds will have to be reduced from ten to five.

In each of the six lower wards in B, C, and D hospital, the reduction must be made from six to three beds per ward, and in each of the six upper wards, from six to four beds per ward.

The larger wards in the newer part of the hospital have five windows, or four windows in each. The 12 smaller wards have only two windows in each.

There are no orderlies' rooms.

None of the wards are perfectly ventilated, although in the upper wards of the regimental hospitals there are openings in the ceilings.

All the wards require ventilation by foul-air shafts, carried up from the ceiling to above the roof, and by two inlets for air close to the ceiling.

All the ward grates are of the usual construction ; they might be advantageously remodelled, to save heat and to warm part of the admitted air.

The hospital is lit by candles. Gas ought to be introduced, and a ventilated gas-burner provided for every ward.

There are no lavatories.

There is a bath-room, with a fixed bath, on the ground floor of one of the wings. Part of the room appears to be used as a store or lumber-room, and the whole is not in good condition, and the bath is apparently not much used. For a hospital of this size, the bath accommodation ought to be more extensive, and better appointed.

There is no laundry.

There is a good and sufficient kitchen ; but exactly over the cooking fires is a water tank of iron, so placed that the water in it, which is intended for the supply of the hospital, gets heated and unwholesome. This tank ought to be at once moved outside the building. The kitchen requires ventilation, by a shaft carried up above the roof of the building, and by glass louvres in the windows.

The water supply is forced up by a pump to a cistern under the roof.

The hospital is not sewered. There are surface drains, which carry off the waste water ; but all the other sewage from the water-closets and privies is received into cesspits, which become at times very offensive.

There are no water-closets for the central buildings. There are four in the wings, but they are reserved for the use of bad cases only, on account of the state of the drainage.

The privies in the yard are drained into an open cesspit, which also receives the ashes, and are very objectionable. They require reconstruction as water latrines, with proper drainage. The ash-pit should be removed, and the solid refuse taken away along with that of the barrack, every day.

There is a good exercising ground for convalescents behind the hospital, but it requires covered seats.

There is no accommodation for the sick of married soldiers' families.

As a whole, this hospital is by no means a good one, although in some points it is better than many army hospitals. It admits of being considerably improved ; and if it is to be extended, to afford the additional accommodation required by enlarging the cubic space for the sick, the extension will have to be made on a very different principle from that on which the present building has been constructed.

*We would recommend, for the Sanitary Improvements of the present Buildings :—*

1. The reduction of beds in each ward to the extent specified above.

2. Ventilation of every ward by a foul-air shaft, and by two inlets for air. Reconstruction of the ward grates, to save heat and to warm part of the admitted air in winter. Ventilation of each staircase by a louvred shaft through the roof, and by perforated panes in the windows. Ventilation of the kitchen by an air shaft, and glass louvres in the windows.

3. Gas to be introduced, and a ventilated gas-burner to be provided for every ward.

4. Lavatories for convalescents to be provided.

5. Bath-room to be improved, and additional baths, with hot and cold water laid on, to be provided.

6. Water tank to be removed out of the kitchen.

7. The whole hospital to be sewered to an outlet, along with the barracks. All cesspits to be abolished, the ash-pit in the yard to be removed, and the privies to be reconstructed as water latrines. Water-closets to be provided for the centre of the building.

8. Covered seats for convalescents to be put up in the yard.

Lastly. In adding to the hospital, it would be well to provide accommodation for the sick of married soldiers' families.

### 2. Cat Fort Barrack.

This is a small barrack, having five soldiers' rooms, and regulation accommodation for 100 men. It is used as a recruiting depôt, for which purpose it is stated to be conveniently situated. Otherwise, it is a very defective building.

It is situated on high ground, overlooking part of the city of Cork, and is surrounded by a dense, filthy neighbourhood of houses. The barrack-rooms are in a single line, two stories in height, having a narrow courtyard, enclosed by high walls in front, and directly abutting on the houses of the civil population behind. The rooms have windows back and front, and they have thus the means of thorough ventilation.

The following is the accommodation :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 1 | 18 | 10 | 8 |
| 1 | 18 | 10 | 8 |
| 1 | 18 | 13 | 5 |
| 1 | 18 | 10 | 8 |
| 1 | 28 | 17 | 11 |
| Total - | 100 | 60 | 40 |

Several of the rooms were occupied by serjeants' families at the time we inspected this barrack, but they were still on the construction for the accommodation stated in the table. By removing 40 men out of the building, the remaining 60 will have rather less than 600 cubic feet per man ; and 60 men is certainly as many as ought to be placed in such a barrack.

The rooms are ventilated by air shafts, but they have no inlets; and it will be necessary to insert two air bricks close to the ceiling of each room, one on either side between the windows, and to cover them by a short cornice of perforated zinc for diffusing the air.

The fire-grates are of the usual construction, and might be remodelled with advantage, to save heat.

There is no lavatory and no bath. At present the men wash in an open shed. A lavatory should be constructed, with space for one bath.

The privy opens into a cesspit, and is dark and offensive. It requires reconstruction as a water latrine, with proper drainage, lighting, ventilation, division of seats, and half-doors, and the cesspit should be abolished.

The women's wash-house is dark, and has neither boiler nor stove. It ought to be provided with these necessary conveniences.

The cook-house requires an oven.

The barrack is lit with candles. A ventilated gas-burner ought to be placed in every room.

At the time of our inspection of this barrack, part of it was undergoing repair, but the whole building requires to be put in a thorough state of repair, besides having the defects we have described supplied.

*We would recommend :—*

1. That the accommodation in this barrack be reduced to 60 men, in the manner pointed out.

2. That two air bricks, with perforated zinc cornices, be introduced into each room, between the windows, as inlets for air. The fire-grates to be remodelled.

3. A lavatory to be built, with space for one bath, and water laid on.

4. The privy to be reconstructed as a water latrine, with drainage, light, ventilation, division of seats, and half-doors ; and the cesspit to be abolished.

5. Women's wash-house to have a boiler and drying stove.

6. Cook-house to be provided with an oven.

7. Gas to be introduced, and a ventilated gas-burner to be placed in every barrack-room.

### 3. Fort Elizabeth.

This building is situated in a densely peopled neighbourhood, not far from Cat Fort, and is surrounded by lofty walls. It was originally built as a prison for prisoners of war ; and is, as is to be hoped, the worst specimen of prison architecture now existing in the United Kingdom. It is a large single block of buildings, the entire front of which, facing the court, is covered by a corridor, with small distant windows ; and out of this corridor open a series of miserable cells, of greater or less dimensions, having each one window and a small opening looking out against a dead wall, above which rises the rampart of the fort.

In its present state this building is quite unfit for human habitation, especially as a barrack ; and it would be well to consider whether it might not be used for some other public purpose than to hold either soldiers or prisoners. As it stands on the returns sent us as a barrack, we shall report on it as such, with the reservations here stated.

It contains 18 rooms, in three stories, with regulation accommodation for 180 men, arranged as follows :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 6 Lower - | 60 | Not fit for occupation. | 60 |
| 6 First Floor | 60 | 30 | 30 |
| 6 Top Flat - | 60 | 30 | 30 |
| Total - | 180 | 60 | 120 |

The whole of the lower rooms are unfit for occupation by troops, and cannot be materially improved.

They are enclosed between the corridor in front and the lofty walls immediately behind them.

Something might be done to improve the two upper flights of rooms. The wall of the corridor facing the courtyard is pierced with small openings in a blind arch. The first thing to be done would be to open all these arches to their full size, and to put glazed windows in them, with panes of perforated glass for ventilation. The window space ought to be made as large as possible.

Next, there is a lofty brick wall behind, and between the windows of the barrack-rooms and the rampart. This wall ought to be removed.

Each of the smaller openings in the rooms ought to be enlarged, to make a second window, and a window ought to be made between each barrack-room and the corridors.

These changes are required for lighting the building.

None of the rooms are ventilated ; and, to remove this defect, it will be necessary to carry a shaft from the ceiling of each room to the roof of the building, and to insert a pane of perforated glass into each barrack-room window. The grates would also have to be remodelled.

Besides the inappropriateness of the barrack-rooms, there are three deficiencies requiring to be supplied.

There is no ablution-room, and no bath.

The cook-house is dark, and has no oven.

The privy drains into an adjoining cesspit, and is very offensive ; it has no division of seats ; it requires to be reconstructed as a water latrine, and drained.

The guard-house requires ventilation by an inlet for air.

The rooms are lit with candles ; a ventilated gas-burner is required for each room.

When these improvements in the barrack-rooms are carried out, there will be accommodation in Fort Elizabeth for 60 men, and for no more.

*The Sanitary Improvements required for this Barrack are as follow :—*

1. The ground floor to be taken from the construction, as being unfit for occupation, and five men to be removed out of each of the remaining barrack-rooms.

2. Windows with perforated glass panes to be opened through the external wall of the two upper corridors.

3. An additional window to be made to each barrack-room, instead of the small opening in the back wall. A window to be made from each barrack-room into the corridor.

4. Each barrack-room to be ventilated by a shaft, carried up from the ceiling to the roof, and by perforated glass panes in the windows. The fire-grates to be remodelled to save heat.

5. An ablution house to be built, with space for one bath, with water laid on.

6. Additional light to be given to the cook-house, and an oven to be provided for roasting meat.

7. Privy to be drained and reconstructed as a water latrine, with drainage, division of seats, half-doors, light, and ventilation. Cesspit to be abolished.

8. Guard-house to be ventilated by an inlet.

9. A ventilated gas-burner to be introduced into each barrack-room.

### 4. Royal Artillery Barracks, Ballincollig.

These barracks are about seven miles from Cork, and are situated near the village of Ballincollig, about half a mile from the river Lee, and about 70 feet above its level.

They consist of two squares, one formed by the officers' quarters and the mess establishment ; and the other by the men's quarters, stables, &c.

The total area of ground connected with these barracks is 60 acres ; the soil is gravelly, and there is sufficient fall for drainage. The buildings are of stone, and were erected between 1807 and 1809.

With the exception of the defects about to be mentioned, the whole establishment is in an excellent condition, and is kept in good order.

The men's quarters contain 39 rooms, with regulation accommodation for 400 inmates.

The rooms accommodate, some 10, and others 14 men, and there are five smaller rooms occupied by non-commissioned officers.

The following table shows the present regulation accommodation in the men's rooms, compared with what it would be at 600 cubic feet per man :—

| Rooms. | Present Regulation Accommodation in Men. | Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 22 Ten-men Rooms | 220 | 176 | 44 |
| 12 Fourteen-men Rooms - - - | 168 | 108 | 60 |
| Total - - | 388 | 284 | 104 |

There is, thus, a deficiency of space for 104 men. The first series of rooms in the table will not divide into spaces of 600 cubic feet each, without leaving a considerable remainder ; but as the barrack is in the open country we have given rather less than that amount per man.

It will be necessary to reduce the overcrowding in this barrack, by removing two men out of each of the 10-men rooms, and five men out of each of the 14-men rooms, which will leave 284 men as the maximum number the rooms ought to hold.

The rooms are in houses two stories high, with a basement. They are reached by good wide staircases, and have through and through passages. The rooms occupy the whole breadth of each house, and have two windows back and front. They have each one fireplace, with a large grate, consuming more fuel than would be required were the grates remodelled.

Several of the rooms have ventilating shafts carried up into the roof of the building, but not above the roof. Each of these shafts should be elongated, and carried upwards above the ridge, and similar shafts ought to be carried up from the ceilings of all the rooms where there are no shafts at present.

In every case there should be an inlet for air by an air brick, close to the ceiling, between every two windows back and front, and the opening of the air brick should be covered with a perforated zinc cornice, to diffuse the current.

All the rooms are lit by candles. There are no public gas-works, but it is stated that gas might be obtained from a mill about a mile distant.

There is no day-room for the men.

There is a school-room in a one-story building adjoining the stables. It is not in a good position, and the smell from the litter pervades it to such an extent that it has been found necessary to close up windows and to diminish the light and ventilation, in order to escape from the nuisance. It would be advisable to provide a school-room in a more suitable locality ; but in the meantime additional light ought to be given to the present room by skylights. The room requires additional ventilation, which could be easily provided through the roof, by leaving an opening round the stove pipe where it passes out.

There is one library. It is placed in a small room, and requires ventilation by a silk flap ventilator in the chimney, and by ventilating panes in the windows.

There are two lavatories, one for each range. They are in the basement of the buildings, and are gloomy, cold, and damp. Each of them is provided with an iron bath, boiler, and foot-pans. There are foot gratings, but no pegs. These ablution-rooms are much behind the barrack in their position and arrangements, and they might advantageously be removed, and others provided above ground, but connected by covered passages with the barracks.

There are two wash-houses, one of which was an old cook-house. It has twelve boilers, but has no fixed tubs, and no laundry or drying stove. It requires additional light, either by windows or skylights.

There are two good cook-houses, with boilers, but

there are no roasting ovens. One should be placed in each cook-house.

The serjeants' mess is in a barrack-room. It requires ventilation. The mess kitchen requires a cooking range.

There is no cleaning-room or covered drill shed.

There are two tailors' workshops, one saddlers', one wheelers', one shoemakers', and one armourers' shop, and one forge. The tailors' and saddlers' shops are too dark. The former are in the basement, All the shops require ventilation, by silk flap ventilators into the chimnies and perforated panes of glass.

A painters' shop near the wheelers' shop is said to be required. A small store next this shop would afford the required accommodation.

The artillery stores are complained of as being insufficient, and the forage store is much too close to the magazine.

The water supply of these barracks is derived from four wells and twelve small tanks. It is insufficient, and six horses have to be employed every day to fetch water from the river. The supply requires improvement, either by deepening the wells or by throwing water up from the river by some mechanical power, such as a water ram, a water wheel, or a windmill. The whole of the roof water ought to be collected for use.

The privies are drained into a cesspit, which has an overflow to the river. They receive the water of the ablution houses and wash-houses. They were very offensive, and require to be reconstructed as water latrines, and either drained directly to the river or else into a cesspit, at a distance from the barrack, with an overflow.

The urinals have no water at present, and they are not sufficient in number, considering the extent of the barrack. The drainage, generally, has been done by means of square drains, the worst form that could be selected for such a purpose. We would strongly advise that drainage by earthenware pipes be adopted, as the existing drains fall out of repair.

There is no accommodation for married soldiers. At the time the return was made to us, there were 48 women accommodated in soldiers' rooms in these barracks, besides those living in the adjacent village. The latter are wretchedly accommodated, and there has been much disease among them in consequence, particularly among children.

The guard-room has regulation accommodation for 17 men, with no more than 241 cubic feet per man. Like other guard-rooms, it is much overcrowded, but usually the actual occupants of guard-rooms are fewer than the regulation number. In this case, however, the guard-room is returned to us as fully occupied. The regulation number should be reduced to one-half, or the guard-room enlarged; and it should be ventilated by an air shaft and inlet. The lock-up also requires similar ventilation. It has no means of warming. The guard-room fireplace and grate might be remodelled, to supply the lock-up with fresh warmed air.

The solitary cells and lock-up are confined and damp, and men sent to them have frequently become ill in consequence.

The orderly-room is complained of as being too small. The canteen has no cellar. The tap-room requires ventilation by a silk flap ventilator into the chimney, and by perforated glass panes in the windows.

A riding school is stated to be much required.

The drill field is undrained, and the surface is not in good condition in consequence.

*The following are the Sanitary Improvements required for Ballincollig Barracks:—*

1. Reduction of numbers of men in the barrack-rooms and in the guard-room to the extent stated.

2. Introducing a ventilating shaft into all the barrack-rooms where there are none; continuing all the present ventilating shafts above the roof of the building; providing an inlet for air between every two windows, and covering the inlets with short perforated zinc cornices.

Remodelling the room grates, to save fuel and to heat part of the inflowing air in winter.

Ventilating and warming the guard-room and lock-up by means of shafts and inlets, and by remodelling the guard-room grate; ventilating the workshops by silk flap ventilators and perforated glass panes, and the serjeants' mess by a shaft and inlet for air; ventilating the library and canteen by silk flap ventilators in the chimney, and by perforated glass panes in the windows.

Ventilating the school-room by an open space round the stove pipe where it passes through the ceiling, and additional light to be given by a skylight.

3. A day-room and covered drill shed to be provided for the men.

4. Present ablution houses to be provided with pegs.

5. Wash-houses to be provided with fixed tubs, and water laid on; and with a drying closet, or a drying and laundry stove; additional light to be given by windows or skylights.

6. Each cook-house to be provided with a roasting oven, and a cooking range to be provided for the sergeants' mess kitchen.

7. Water supply of barrack to be increased by deepening the wells, or from the river, and all the roof water to be saved for washing.

8. Privies to be reconstructed as water latrines, supplied with water, and drained in one of the modes stated; also to have division of seats, half-doors, light, and ventilation; urinals to be increased in number, and supplied with water.

Lastly, married quarters ought to be provided.

*Hospital, Ballincollig.*

This is a two-story building, situated at the far end of the barrack square, close to the chapel, and overlooking the drill ground. It has seven wards. According to the present regulation, these wards ought to accommodate 50 beds, each bed having only 549 cubic feet of space. The extent to which the wards are overcrowded will be seen from the following table:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Space. |
|---|---|---|---|
| Nos. 1 | 50 | 2 | 20 |
| 2 | | 6 | |
| 3 | | 6 | |
| 4 | | 2 | |
| 5 | | 6 | |
| 6 | | 6 | |
| 7 | | 2 | |
| Total - | 50 | 30 | 20 |

It will be seen that the regulation number exceeds the accommodation by 20 beds; and to accommodate the smaller number, it is necessary to give less than 1,200 cubic feet per bed. The third column in the table shows the number of sick each ward ought to contain. No. 1 ward is used for the orderlies, and ought to be taken off the construction.

The wards have a window only on one side, and are deficient in ventilation. They have small ventilating tubes in the corners, but these are of very little use. A ventilating shaft should be carried up from the ceiling of each ward above the roof, and

two inlets for air, covered with perforated zinc cornices, should be made in the outer walls.

There are two halls in this hospital containing water tanks. They are dark, and should have skylights in the roof for light and ventilation. There is a good bath-room, but there is no fixed bath; one such bath should be provided, with hot and cold water laid on. There is no ablution-room for the sick. The water supply is defective, apparently from want of sufficient storeage. In remedying this defect, the tanks ought not to be placed under the roof of the hospital, as has been done already, but outside.

There is one water-closet upstairs, but none below; there are three privies, with a cesspit at the end of the hospital yard, with a covered way leading to them. The privies should be converted into a water latrine, with seats, and the cesspit abolished.

The stores are defectively fitted up, and at the time we inspected them we found rice kept in new wooden frames of close-stools. This should be avoided, and proper drawers provided. The pack store requires shelves and racks.

There is no accommodation for the sick of married soldiers' families.

The dead-house has no dissecting table, and no water laid on.

*The Sanitary Improvements required for Ballincollig Hospital are:—*

1. Reduction of number of sick to give 1,200 cubic feet per bed.

2. Ventilation of all the wards by shafts and inlets for air. Fire-grates to be remodelled, to warm the air in winter; skylights for light and ventilation to be placed in the roof of the halls. Staircase to be ventilated by perforated glass panes in the windows.

3. A fixed bath, with hot and cold water laid on, and an ablution table to be provided.

4. Privies in the yard to be reconstructed as a water latrine and drained. The drainage to be improved as suggested, and the cesspit abolished. Water supply to be improved.

5. The stores should be fitted up with drawers, shelves, racks, &c., as pointed out.

Lastly, it would be very advisable to provide a room to receive cases of illness occurring among the families of married soldiers.

## II.—CORK HARBOUR.

We have inspected the following barracks and hospitals in this neighbourhood:—

1. The General Hospital, Queenstown.
2. Carlisle Fort.
3. Camden Fort.
4. Spike Island.
5. Haulbowline.

### 1. The General Hospital, Queenstown.

This building, as we have been informed, was originally intended for a barrack. It consists of a centre and two slightly projecting wings. It has two staircases. The wards are at the ends, and the officers' quarters in the centre.

The buildings are situated on a plateau, quarried out of the steep slopes of the ground, which at this point overhang the harbour. The plateau is about 80 feet above the water, and close to it. The buildings face due south, and the ground rises rapidly to a considerable height behind them and close to their back walls. But for this latter circumstance, the site would be a fine and salubrious one, and well fitted for a general hospital, requiring a mild genial climate.

The following is the present regulation accommodation, as compared with what it would be at 1,200 cubic feet per bed:—

| Wards. | Present Accommodation. | Accommodation at 1,200 Cubic Feet per Bed. | Deficiency in Bed Space. |
|---|---|---|---|
| 1 | 5 | 3 | 2 |
| 2 | 5 | 3 | 2 |
| 3 | 5 | 3 | 2 |
| 4 | 6 | 3 | 3 |
| 5 | 6 | 3 | 3 |
| 6 | 6 | 3 | 3 |
| 7 | 4 | 2 | 2 |
| 8 | 7 | 3 | 4 |
| 9 | 7 | 3 | 4 |
| 10 | 5 | 3 | 2 |
| 11 | 5 | 3 | 2 |
| 12 | 6 | 3 | 3 |
| 13 | 6 | 3 | 3 |
| 14 | 5 | 3 | 2 |
| 15 | 5 | 3 | 2 |
| 16 | 5 | 3 | 2 |
| Total | 88 | 47 | 41 |

None of the wards will divide into spaces of 1,200 cubic feet each, without leaving a considerable remainder. We have divided the cubic space as nearly as possible into equal parts; but in every ward, except one, the space we have allotted per bed is under 1,200 cubic feet. Even at this reduced amount, it will be seen that the buildings will contain no more than 47 beds. Fortunately the average number of sick is considerably below 47; and we would recommend that the numbers in each ward be at once reduced to the extent specified, and the excess of beds removed from the wards.

The wards, or rather the small rooms of which this hospital consists, are by no means well suited for the reception of sick.

They are low in the ceiling, and imperfectly lighted and ventilated. With two exceptions, they have only two windows each, and most of the wards have no thorough draft.

This latter defect might be removed, in several of the wards, by opening windows at the back of the building; and this we would advise being done wherever possible.

The atmosphere in most of the wards, at the time we were in them, was very offensive, and the means for supplying fresh air wholly inadequate. To remedy this important defect, it will be necessary to carry a ventilating shaft from the ceiling of each ward, above the roof of the building. An inlet, covered within the ward by a perforated zinc cornice and a regulating valve, should also be introduced on each side of the ward.

The staircases require ventilation, by means of a shaft carried from the upper ceiling of each above the roof of the building, and by having panes of perforated glass inserted into the stair windows.

There are no rooms for orderlies.

There are three slate baths in a room on the ground floor. They are properly supplied with hot and cold water, but there are no divisions between them, and there are no pegs nor seats. These defects could be easily remedied.

There are two kitchens, with sufficient means of cooking; but there are no sinks. One should be supplied to each kitchen, and it should be properly trapped.

The water supply is derived from a rain tank. It is precarious and insufficient. We would advise that a proper water supply be obtained for the hospital, either from the Queenstown mains, if available, or by bringing in spring water. The present method of supply is not to be depended on.

With such an amount of fall as exists between the hospital and the sea, there are ample means of drainage, yet there are no water-closets in the building, and the patients have to walk across the open ground in front of the hospital to reach an open privy situated beyond the eastern end of the buildings. This privy drains down to the sea, but is not supplied with water. We would recommend that one of Macfarlane's water latrines be provided for it. This privy requires to be lighted through the roof.

There is a small closet at the back of the hospital stairs which might be turned into a water-closet, if properly lighted, and ventilated by a shaft and inlets for air, similar to those required for the wards.

The pack and provision stores are defective. The former is damp; the latter is both dark and damp. Both require thorough ventilation.

There is no bedding or linen store. A ward is used instead.

There is no accommodation for the sick of soldiers' families.

*The following is a Resumé of the Sanitary Improvements required for this Hospital:—*

1. Reduction of numbers in each ward, to the extent specified.
2. Ventilation of each ward by shafts and inlets for air, by remodelled grates, and by opening additional windows.
3. Ventilation of the staircases by shafts and perforated glass panes.
4. Ventilation of the kitchens and stores by shafts and inlets. A trapped sink to be provided in each kitchen.
5. Construction of water-closets, one for each wing; and converting the privies into water latrines.
6. Improved water supply.
7. Providing divisions for the baths, and seats and pegs in the bath-room.

Some of the chimnies in this building smoke to such an extent as to give rise to serious inconvenience. This defect should also be remedied.

## 2. Carlisle Fort.

This fort stands at the eastern side of the entrance to Cork Harbour. It is situated on the top of a hill, at a considerable elevation above the sea, and in a healthy position.

The barrack accommodation consists of two ranges of building, one of which consists of one story and a basement. The site it occupies has been quarried out of the hill. The basement is entirely below the ordinary level of the ground behind; and the upper floor is somewhat below the level. This block contains two long rooms, with windows only on one side. The upper room is used for soldiers; the lower room in the basement is at present occupied by convicts, engaged on the works at the fort. As the latter occupation is only temporary, and as the whole of the buildings may at any time be occupied by troops, it will be necessary to deal with them with reference to that contingency.

Each of these long rooms has regulation accommodation for 30 men, with a cubic space of 400 feet per man. They have windows only on one side. The upper room has two squares of perforated zinc in the ceiling for ventilation; but the ventilation is not sufficient. Two louvred turrets are required. They should be carried above the roof; and there should be four inlets made in the walls close to the ceiling, two on either side, with perforated zinc cornices, for admitting fresh air.

Besides this, windows ought to be opened in the back wall of the room, to correspond as far as possible with those in front.

The lower room requires two shafts, and four inlets, with perforated zinc cornices, for ventilation.

The other quarters consist of two small rooms, for seven and ten men, in a line running parallel with the first block. These rooms require ventilation by a shaft and inlet. It would be advantageous also to open additional windows in these quarters.

The water supply for this fort is derived from two wells, one within the fort, the other at the foot of the hill. The supply is described as being precarious, and as leading to great inconvenience during dry seasons.

The well in the fort ought to be deepened, to ensure a more constant supply, and a cistern should be provided for containing sufficient water for flushing out the privies. A small pumping windmill engine, such as is now used for similar purposes, might be advantageously erected for raising the water.

The privies are of the usual construction, and empty into cesspits. They are in a very noxious condition, and require to be reconstructed as water latrines. Macfarlane's iron latrine would be the best form, as it would be the least expensive, and require the smallest amount of water. The cesspits should be removed, and the privies flushed directly to the sea.

There is no ablution-room in the fort. There is plenty of space in which a small one might be erected. A single bath ought to be placed in it.

There is no wash-house for soldiers' linen.

There are two cook-houses, furnished with boilers of the old pattern, but there are no other means of cooking. A roasting oven of sufficient size ought to be placed in one of the kitchens.

The barrack-rooms are lit with candles. Gas is not available. There is neither day-room, school-room, nor library. There is no accommodation for married soldiers.

Besides the soldiers' quarters described above, there are three casemates, reached by a long dark passage.

They are not occupied by troops, and are not fit for occupation, except in case of emergency; they are dark, and imperfectly ventilated, and it would be difficult to improve them.

From the structure of the barrack-rooms in this fort, which resembles that of huts rather than of barracks, and considering the lofty, airy situation of the buildings, and the small number of men they are intended to contain, we do not consider it necessary to advise such a reduction of numbers as would be requisite to give 600 cubic feet per man, for we consider that, by opening additional windows and improving the ventilation, the buildings may be rendered sufficiently healthy. At all events, this is one of those cases in which we feel disposed to try the effect of ventilation in preserving the purity of the air, before advising the numbers in the barrack-rooms to be reduced.

*We would recommend therefore:—*

1. That the two long barrack-rooms, including that occupied by convicts, be ventilated by two shafts and four inlets for air to each room, and that windows be opened in the back of the upper room. That each of the other barrack-rooms have a shaft and inlet for air provided, and an additional window.
2. That the water supply be improved, as suggested.
3. That the privies be converted into water latrines, with drainage, divisions of seats, light, and ventilation, and the cesspits abolished.
4. That an ablution-room, with one bath, and water laid on, be provided.
5. That a roasting oven be introduced into one of the kitchens.

### *Carlisle Fort Hospital.*

This hospital consists of a single ward, into which a case or two of sickness may be received until they can be removed to Queenstown Hospital. It is fit enough for its object, and we have nothing to recommend in regard to it.

### 3. Camden Fort.

This fort is built on elevated ground, on the west side of the entrance to Cork Harbour.

The barrack accommodation consists of three ranges of rooms one story high, built on terraces. A large part of the accommodation is occupied by convicts, and the remainder by a guard.

The soldiers' rooms are somewhat overcrowded, and certain of them have windows only on one side. It would improve the light and ventilation of these to open windows, where practicable, on the opposite side.

All the rooms should have shafts and inlets for air. The guard-rooms also require ventilation.

There are no ablution-rooms, and no baths nor wash-houses.

The cook-houses have boilers, but no ovens.

The water supply is derived from a well, which fails in long droughts. The well ought to be deepened.

The privies are very offensive, and ought to be reconstructed with Macfarlane's apparatus.

Camden Fort requires sanitary improvements similar to those we have advised for Carlisle Fort.

About a third part of the occupants should be removed from the rooms at present occupied by troops, but the possibility of doing so will, of course, depend on the number of guards required for the convicts. The barrack-rooms are much more crowded than those of Carlisle Fort.

*As regards other matters, we would recommend:—*

1. That each barrack-room be ventilated by a shaft and inlets, and that the guard-rooms be similarly ventilated. Additional windows to be opened in the barrack-rooms, where practicable, on the side opposite the present windows.
2. That an ablution-room with one bath be provided.
3. That the privies be reconstructed as water latrines, and drained, and the water supply increased if necessary.
4. That a roasting oven be provided for the kitchen.

### 4. Spike Island.

A large fort is in course of construction on Spike Island, with extensive casemated barracks surrounding the parade ground.

The completed part of these barracks is occupied by the convict establishment, supplying labour for the works. The soldiers are on guard, and occupy no part of the barracks, but are quartered in a range of casemates, built in the works, right and left of the entrance gate.

The works are still in progress; but before the fort is finally given over to the troops, considerable alterations will have to be made for securing the health of the men.

The barracks consist of long arches, built side by side, with windows and doors at the end. The distance from window to window is no less than 48 feet 8 inches, so that the means of light and ventilation provided in the structure are very defective.

The casemates occupied by the troops have two windows, a door, and a fanlight at one end. They have regulation space for 14 men each. They appear to have been originally unprovided with the means of ventilation; but to supply this defect an open iron tube, with funnel-shaped inlets, has been carried along the crown of the arch, and up through the masonry, to give exit to the foul air. The ventilation of these casemates might be still further improved, by inserting panes of perforated glass in the top part of each fanlight.

Some of the present arrangements affecting the health of the troops are of a temporary character; but as a considerable time must elapse before the works are completed, we are of opinion that the arrangements likely in any way to affect injuriously the health of the troops ought to be improved.

For example, the present arrangement of latrines is defective. They require to be reconstructed as water latrines, with divisions of seats and half-doors. The present cook-house requires an oven; and a bath, for the purposes of cleanliness, might be added to the ablution-room.

A very extensive range of latrines has been constructed in the south face of the works behind the barracks. They are drained, that is to say, the soil is received into an open drain, in which the contents are penned up at intervals to obtain a flush of water through it. The plan is very objectionable, and these privies will become very noxious when used by a body of troops such as the barracks would contain; they should be forthwith converted into proper water latrines, and provided with divisions of seats and half-doors, light, and ventilation.

The water supply of this fort also requires extension, for it is stated to become insufficient in dry weather.

The whole of the barracks now occupied by convicts will require to be ventilated before being given over to the troops.

New casemates are now being constructed, and the ventilation of these should be provided for in the building. We should suggest that these casemates should have much more light introduced than has been done in those already finished, and that, for ventilation, inlets for air of the usual construction be formed at the summit of the arch at the end nearest the door, and that a vertical shaft be carried up in the masonry near the end of the casemate opposite the door. The area of the shaft should be equal to 12 square inches per man.

The fireplaces should be constructed with means of warming part of the air admitted into the casemate.

There is a hospital for convicts within the fort. It has been constructed on defective principles, and it is hoped will not be used for soldiers. The building would be better adapted for other purposes.

*We would advise for the Quarters occupied by Troops as follows:—*

1. To reduce the numbers in the casemates, to give as nearly as may be 600 cubic feet per man, as soon as sufficient accommodation has been provided to admit of this being done.
2. To improve the ventilation of the occupied casemates, by perforated panes of glass over the doors; and to provide ventilation in the new casemates as suggested.
3. To provide a roasting oven for the kitchen.
4. To provide a bath in the ablution house.
5. To reconstruct the soldiers' privies as water latrines, with divisions of seats, half-doors, light, and ventilation.
6. To provide a drying stove for the women's wash-house.

### 5. Haulbowline.

These barracks are situated on an island between Spike Island and Queenstown.

The barrack-rooms accommodate 21 men each by existing regulation. They open out of a central passage. There are two rooms on each floor, and the rooms have two windows on each side. There is a serjeants' room at the end of the passage. Each room has a cubic capacity of 7,900 feet, and could accommodate at the outside 14 men instead of 21.

None of the rooms are ventilated, and they all require shafts and inlets for air. A shaft should be carried from the ceiling of each room to above the roof, and two inlets, with perforated zinc cornices, should be introduced, one on either side of the room, and the fire-grates should be altered to warm part of the air admitted.

The passage also requires ventilation in a similar manner.

There is no ablution-room and no bath. There is abundance of space for erecting a proper room.

The cook-house requires additional light and ventilation. It is supplied with boilers, but has no other means of cooking. A roasting oven should be introduced.

The privies require to be reconstructed as water latrines, with a proper supply cistern.

There is a large open ash-pit badly placed. It would be advisable to abolish it altogether, and to discharge the ashes into the sea.

There is a tower containing a room occupied on sufferance by married soldiers. It is dark and without ventilation, and unfit to be occupied ; but soldiers' families prefer it to having to find lodgings. The only improvement that can be suggested is to make the one window open fully instead of opening only partially, as it does at present.

There is a room used for the treatment of any slight cases of sickness, but it is not, properly speaking, a hospital.

*The Sanitary Improvements required for these Barracks are :—*

1. Reduction of numbers, as stated.
2. Ventilation of the rooms by shafts and inlets for air. Ventilation of the passage.
3. Erection of an ablution-room containing one bath.
4. An oven to be provided for the cook-house. Additional light and ventilation to be introduced.
5. Abolition of the ash-pit, and reconstruction of privies as water latrines, with means of flushing, and divisions and half-doors.
6. To improve the ventilation of the married quarters in the tower, as already mentioned.

## III.—BANDON AND KINSALE.

### 1. Bandon Cavalry and Infantry Barrack.

This barrack has regulation accommodation for 108 men. It is situated on high ground—1 acre and 28 perches in area—at the outskirts of the town of Bandon, and has excellent facilities for drainage, with an outlet into the Bandon river close at hand.

The underlying rock of the district is slaty. All the buildings are of stone, and were erected 50 or 60 years ago.

The barrack consists of a central range, with two slightly projecting wings. The entrance is by an archway through the central portion. On each side of the archway are placed the officers' quarters, beyond them are the barrack stores, and the men's rooms are at the two ends of the buildings.

The cavalry barracks are in two blocks, running parallel with the main building, at the opposite side of the parade ground. The ground floor of these quarters consists of stables, and the upper floor of men's rooms. They are not occupied at present, and are used as stores.

The main infantry building consists of three stories, and the upstair rooms are reached by narrow wooden staircases and landings.

The following table shows the regulation accommodation, contrasted with what it would be at 600 cubic feet per man :—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| D—1, 2, 3, 4 - | 32 | 20 | 12 |
| E—1, 2 (Cavalry) | 20 | 16 | 4 |
| F—1, 2, 3, 4, 5, 6 | 48 | 30 | 18 |
| Total - - | 100 | 66 | 34 |

Allowing, as nearly as may be, 600 cubic feet per man, these barracks would accommodate 50 infantry and 16 cavalry, in all 66 men.

The rooms vary in their degree of light and means of ventilation. Some of them are close to a high wall, and have windows only on one side. In some the windows are very small. In some rooms there has been an endeavour made to supply ventilation, but not enough.

Every room ought to be ventilated by a separate shaft, carried up from the ceiling to above the roof, and each room should have an inlet for air, by means of an air brick and perforated zinc cornice close to the ceiling.

The fire-grates, which are of the old pattern, should be remodelled, to save heat and warm part of the air admitted in winter.

The lighting of all the dark barrack-rooms ought to be improved, by opening or enlarging windows ; this would further improve the ventilation.

Windows should also be opened in the rear of the passages, to increase their ventilation.

The stables require ventilation, by shafts carried up from the corners to above the roof, and by perforated glass panes in the windows. They also require more light, by additional window space.

Bandon barrack is deficient in a number of requisites.

It has no day-room, school-room, nor library.

It has neither ablution-rooms nor baths. There is plenty of space on which these requisites for personal cleanliness could be erected.

There is no wash-house ; and no accommodation for married people. At the time of our inquiry, 11 women were accommodated in men's rooms.

The cook-house requires a roasting oven, and additional ventilation through the roof.

The privies are in a very offensive condition, and require to be entirely reconstructed as water latrines, with drainage to the river, divisions of seats, half-doors, light, and ventilation.

The urinals need water for cleansing.

The water supply is derived from two pumps and a water tank, but all the roof water is not collected for use. The supply appears to be sufficient for the purposes required.

There is no cleaning-room, no covered drill shed, and no ball court.

The guard-room is under one of the officers' quarters. It is unventilated, and requires a shaft and inlet similar to those recommended for the barrack-rooms.

There are two prison cells, situated at a considerable distance from the guard-room, and there are no means of communication, in case of necessity, between the prisoners and the guard.

Bandon barrack is one of those small barracks so numerous in Ireland, which it would be inadvisable to incur any great cost in improving, except in the matters more immediately connected with the soldiers' health.

*For this object, we would recommend :—*

1. Reduction in the number of inmates in these rooms, to afford, as near as may be, 600 cubic feet per man.
2. Improving the light of the darker rooms, by enlarging windows, or opening additional windows at the back.
3. Ventilating every barrack-room, and the guard-room, by a shaft carried from the ceiling to above the roof, and by an inlet for air into each room, and by remodelling the grates, as described.
4. Ventilating the stables by four shafts, one at each corner, carried above the roof of the cavalry range, and by perforated glass panes in the windows. The stables also to have more window space provided.
5. Cook-house to have a roasting oven introduced, and to have additional ventilation through the roof.
6. All the privies to be drained, and reconstructed

as water latrines, in the manner pointed out. The urinals to be supplied with water.

7. An ablution and bath room, with one bath, and water laid on, to be erected in a convenient locality.

*Bandon Barrack Hospital.*

This hospital is situated within the barrack square, at the back of the stables. It is a small building, consisting of two four-men wards, with a kitchen, used also as a surgery, on the ground floor.

The wards have windows on two sides. They are ventilated into the staircase ; but each ward requires a separate shaft and inlet for air, as does also the kitchen.

There is no water-closet attached to the hospital, and the patients have to walk some distance in the open air to the barrack privy.

The kitchen range is not suitable for hospital cooking, and a new range is required.

It would be advisable to partition off accommodation for the surgery.

This hospital is very little used ; and one of the wards is at present occupied by the hospital serjeant.

*We shall confine our Recommendations only to the following points :—*

1. Ventilation of the wards by shafts and inlets ; also ventilation of the kitchen by a shaft and inlet.
2. A proper cooking range to be put up in the kitchen.
3. A water-closet to be provided.

2. Kinsale Barracks.

These barracks cover an area of 7A. 1R. 16P. in extent, and occupy an elevated, airy, healthy position, at a short distance from the town of Kinsale. They consist partly of stone buildings, partly of wooden huts. The former were erected in 1798, the latter within the last two years. The stone buildings form three sides of a square open to the south, and the wooden huts are erected in line near the south wall. The officers' quarters occupy the central building. All the buildings are three stories high. Those of the soldiers consist of houses with a central passage and staircase, with the barrack-rooms entering right and left.

The general plan of the barrack is such as to ensure a thorough external ventilation of all the buildings.

The total regulation accommodation in this barrack is for 581 non-commissioned officers and men.

The following table gives the details of the men's accommodation in the permanent barracks :—

| Rooms. | Total present Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Total Deficiency of Accommodation in Men. |
|---|---|---|---|
| 56 | 448 | 336 | 112 |
| Q 1 | 6 | 4 | 2 |
| Total - | 454 | 340 | 114 |

All the rooms except Q 1 are eight-men rooms ; and by removing two men out of each room, the remainder will have somewhat less than 600 cubic feet per man.

The five wooden huts are intended to accommodate 25 men each. They are of good construction, but have not sufficient means of ventilation, and they are overcrowded. We would advise the regulation number of men to be reduced from 25 to 20, which will give 323 cubic feet per man to 20 men.

The ventilation might be rendered sufficient by leaving an opening round the stove pipe where it passes through the roof, and by louvres over each end door.

None of the barrack-rooms are ventilated, although they have openings into the passage and staircase. These openings are not sufficient, and cannot be depended on. We would advise that a ventilating shaft be carried from the ceiling of each room above the roof of the building, and that two air bricks be inserted in the walls of each room close to the ceiling. One air brick should be introduced on each side the room, and it should be covered by a perforated zinc cornice for diffusing the air.

Each staircase should likewise be ventilated by a louvre in the upper ceiling, carried above the roof, and by perforated glass panes in the stair window.

The barrack-rooms have two windows, one on either side. The upper rooms are carried upwards into the roof, so that the windows are considerably lower than the ceilings ; and the rooms are not so well lighted as they should be. This defect could be easily remedied, by inserting a skylight close to the ridge in each upper room.

All the fire-grates are of the old defective construction. Much fuel might be saved, and the rooms might be rendered more comfortable, by substituting a better grate, with provision for warming a part of the air admitted for ventilation.

The barrack is lit by candles, and externally by oil lamps. Gas is not available.

There is no day-room and no proper school-room or library. The present school-room and library are barrack-rooms, taken off the construction for that purpose. They are good rooms, but require ventilation by shafts and inlets, like the other rooms.

There are no ablution-rooms nor baths connected with these barracks. From the extent of ground within the enclosure, three ablution-rooms would be required ; one for each wing of the barracks, and one for the huts. Four baths, at least, would be required for cleanliness.

There is one women's wash-house on the west side of the barrack. It has two coppers, but no other washing or laundry arrangements. It is quite inadequate for the requirements of such a barrack. It is not sufficiently large ; it has not enough of boilers ; it has no tubs, and no means of drying or getting up linen. These deficiencies ought to be supplied, either by erecting a large enough laundry to wash and dry for the whole barrack, or by enlarging the present one, to make it sufficient for one wing, and by providing a laundry for the opposite wing of the barrack. In any case, there should be boilers and fixed tubs, with hot and cold water, gratings, a proper drying stove, and means of ironing linen ; and the whole should be well drained, and ventilated through the roof.

The cooking arrangements are defective; the cook-houses are small, dark, and require ventilation ; they have the ordinary boilers, not in good repair, and are unprovided with any other means of cooking. These cook-houses should be put in a state of repair, lighted, and ventilated through the roof, and each should have a roasting oven put up in it.

The serjeants' mess kitchen requires an oven.

There are no cleaning sheds, but this barrack has the advantage of two covered drill sheds, each 44 feet long, 14 feet wide, and 8 feet high.

There is an armourer's shop, but no other means of pursuing trades.

The water supply is derived partly from two pumps, and partly from two rain-water tanks. It is stated to be good and sufficient ; but some improvement in the way of tanks or distributing arrangements will be necessary for carrying out the improved drainage required.

The present drainage of the barrack is very defective. It is mainly surface drainage, and the putrescent fluid refuse is allowed to saturate the ground at certain points.

None of the privies are properly drained ; they all open into cesspits, and are in a noxious condition. They are dark, unventilated, and have no proper seats.

These defects cannot be completely remedied without the barrack is properly drained. The fall is more than sufficient for the purpose; and an outlet might be obtained into the sea, by a small stream which passes within 200 yards of the boundary.

We would propose that the barrack be drained to the sea with as little delay as possible; and that all the privies be converted into water latrines, with divisions of seats, half-doors, and with light and ventilation through the roof; and that all the cesspits be filled up.

The urinals should be supplied with water.

There is no separate sleeping accommodation for non-commissioned officers.

There are no married quarters.

The canteen tap-room is dark and gloomy, and requires ventilation. The window space should be enlarged, if possible, and a silk flap ventilator inserted into the chimney.

The guard-room is small and overcrowded. It has a cubic capacity of 2,640 feet. There is no lock-up attached to it; and the average number of men, including prisoners, who sleep in it, is 14; a number which allows only 188 cubic feet per man. This we consider a serious defect. It is one common to most guard-rooms. Without entering into any discussion as to the effect of night duty on the soldier's health, there cannot be a doubt that, whatever the effect of night duty may be, the soldier is far less able to bear up against it on coming out of such a place as we have described, with the pores of the skin open, and the whole system poisoned by the effect of the foul air he has been breathing.

The first thing required in the present case is to construct a separate lock-up, and either to extend the present guard-room, to give 600 cubic feet per man to the men sleeping in it, or else to reduce the number of men.

A shaft with louvres should be carried through the roof for ventilation, and the present loop-holes should be used as inlets for air, by placing over them a cornice for diffusing the current, similar to the one recommended for the barrack-rooms. A better and more economical grate should also be introduced.

*The following is a Summary of the Sanitary Requirements for these Barracks;—*

1. The number of men in each barrack-room to be reduced from eight to six, and in each hut from 25 to 20.

2. Each barrack-room, the school-room, library, and serjeants' mess to be ventilated by a shaft carried from the ceiling of the room to above the roof, and by two inlets for air, one on each side, with perforated zinc cornices for diffusing the current. A skylight to be placed in the roof of the upper flat barrack-rooms. Remodelled grates to be introduced into the barrack-rooms. The ventilation of the huts to be improved, by leaving a circular space round the stove pipe where it passes through the roof, and by louvres in each end above the doors. The canteen tap-room to be ventilated by a silk flap ventilator, and by perforated panes in the windows.

3. Ablution-rooms to be erected, and four baths, with water laid on, to be provided.

4. Suitable laundry accommodation to be provided in one of the ways pointed out.

5. A roasting-oven to be put up in each cook-house. The boilers to be repaired, and additional light and ventilation to be provided through the roof.

6. The barrack to be thoroughly drained to the sea. All the cesspits to be abolished. All the privies to be reconstructed as water latrines, with sufficient light and ventilation, divisions of seats, and half-doors. Urinals to be reconstructed, and supplied with water for cleansing.

7. The guard-room to be provided with a lock-up, and to be enlarged, or the number of men on guard to be reduced, to give 600 cubic feet to every man sleeping in it. A ventilating shaft to be carried through the roof, and the loop-holes to be used as inlets for air. The fire-grate to be remodelled.

Lastly. Married quarters should be provided in these barracks. Part of the required accommodation might be obtained by appropriating the present hospital for the purpose.

*Kinsale Barrack Hospital.*

Like many other regimental hospitals, the buildings used for a hospital for these barracks are deficient in the most essential requisites for the rapid recovery of the sick.

They are situated in a corner of the enclosure, in close vicinity to the barrack ranges. They are very complicated in structure, and defective in arrangement, and would, under any circumstances, be difficult to ventilate sufficiently.

As they are not well adapted for sick, the best thing to do would be to build another hospital, for which there is plenty of available space. The present buildings would not be lost on that account; for, although unfit for sick, they could, at a trifling cost, be rendered fit for married quarters, so far, at least, as their extent goes. We should advise this to be done; but until it can be done, it will be necessary to adopt the usual expedients for removing at the least expense to the public, the more obvious sanitary defects, so far as these admit of removal by such means.

The hospital buildings are partly new and partly old. The wards in the older part are small, low, and badly ventilated. There is only one tolerable ward in the newer part of the building. There are two staircases, one for each part; and the communication between these staircases, and between one side of the hospital and the other, is through the surgery.

The following table shows the accommodation for sick, as compared with what it would be at 1,200 cubic feet per bed:—

| Wards. | Present Number of Beds. | Accommodation at 1,200 Cubic Feet per Bed. | Deficiency of Bed Space. |
|---|---|---|---|
| 1 | 10 | 4 | 6 |
| 2 | 5 | 2 | 3 |
| 3 | 5 | 2 | 3 |
| 4 | 5 | 2 | 3 |
| 5 | 5 | 2 | 3 |
| 6 | 5 | 2 | 3 |
| Ward | 5 | 2 | 3 |
| Total | 40 | 16 | 24 |

None of the wards will divide into spaces of 1,200 cubic feet. As a temporary expedient, we have given to each bed considerably less than 1,200 feet, in order that the hospital may afford at least some of the accommodation required for the station. Sixteen beds is the maximum number which the building ought on any account to contain, and it would be much safer to appropriate a soldiers' barrack-room for the slighter cases and for convalescents, than to increase the number of beds in the hospital beyond 16.

There are no rooms for orderlies. The ventilation in all the wards is defective; and we think it necessary that a shaft should be carried from the ceiling of each ward to the roof, and that, in addition to existing openings, an inlet for air should be placed in the wall close to the ceiling of each ward.

The staircases require ventilation by shafts through the ceilings.

One of the wards over the kitchen should have an additional window opened in it, if possible.

There is no lavatory, and no bath-room for the sick, and all have to wash in the wards. Neither is there any water-closet.

These defects should be supplied, by erecting a

building with two water-closets, one bath, and a lavatory table.

There are no means of washing or drying the patients' linen.

The kitchen is dark and unventilated. It requires additional window space, and a shaft to be carried from its ceiling to above the roof of the building, in order to prevent the fumes from entering the sick wards.

The only means of cooking hospital diets consists of an old pattern barrack-grate and a boiler.

A proper cooking-range is urgently required.

There is an offensive privy in the yard, close to the buildings, which empties itself into an uncovered ash-pit.

The privy should be reconstructed, with one of Macfarlane's water latrines, the ash-pit removed, and the hospital refuse taken away daily.

The hospital is defective in many other important points ; but to remove its principal defects would be to reconstruct the building.

We have only ventured to recommend those improvements which are urgently required, if the building is to be used at all for sick. *We sum them up as follows :—*

1. To remove all the beds out of the hospital except 16.

2. To ventilate each ward, by a shaft carried from the ceiling to above the roof, and by an inlet for air ; to ventilate the staircases, by shafts through the ceilings and roof ; to ventilate the kitchen by a shaft from the ceiling.

3. To provide two water-closets, a fixed bath, and lavatory. To convert the privy in the yard into a water latrine, and to remove the ash-pit.

4. To provide a proper cooking range, and to open additional window space for the kitchen.

### 3. Charles Fort.

This fort is situated at the mouth of Bandon river, about two miles south of Kinsale, and commands the entrance to the harbour.

It contains 54 barrack-rooms, casemates, and huts, and has regulation accommodation for 525 non-commissioned officers and men.

The area of ground within the enclosure is 37 acres and 14 perches. The underlying rock is slaty; the fall to the sea is precipitous, and the barrack buildings are about 100 feet above the water.

All the permanent buildings are of stone, and are about two centuries old. The huts were recently erected on the usual model.

The barrack buildings have been planned without regard to health, and are most deficient in light and ventilation, as well as in other important points of structure. One set of the rooms consists of a long building, with projecting wings at each end. It is built against the slope of the ground behind the ramparts, and part of its lower floor is below the surface level.

The only direct light and ventilation admitted to the rooms is from the side facing the high ground, and the windows look directly on the bank behind. On the opposite side, which is also the south side, facing the sea, there is a corridor covering the whole face of the building, so arranged as effectually to deprive the barrack-rooms of the benefit of the sea breeze, or of the sun's rays, which never reach them. This corridor is the means of access to the rooms.

The rooms are gloomy and dark. The window space is insufficient, and in the upper rooms the windows are so low and so close to the floor that it is necessary to stoop to look out. Some of these rooms have skylights.

Most of the rooms have only two windows, many of them have only one, and there are only three rooms in the whole fort that have three windows each.

There is another set of barrack-rooms occupied as staff quarters. There are two rooms on each floor opening out of a central passage, or from the staircase leading to the upper rooms. These rooms, with one or two exceptions, have windows only on one side.

The casemates are short and broad, and have a window on each side the door, with two windows above. All the barrack-rooms are very much overcrowded, according to the present regulation. The extent of this will be seen by the following table. The cubic space varies from 300 to 400 feet per man, but there are only two rooms in which this maximum space is attained.

| Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| A House : | | | |
| 1 | 8 | 5 | 3 |
| 2 | 16 | 10 | 6 |
| 4 | 32 | 20 | 12 |
| 2 | 16 | 12 | 4 |
| 2 | 16 | 10 | 6 |
| B House : | | | |
| 4 | 32 | 20 | 12 |
| 4 | 32 | 20 | 12 |
| 4 | 28 | 20 | 8 |
| C House : | | | |
| 1 | 8 | 4 | 4 |
| 3 | 21 | 15 | 6 |
| D House : | | | |
| 1 | 8 | 5 | 3 |
| 1 | 8 | 5 | 3 |
| E House : | | | |
| 2 | 14 | 8 | 6 |
| 1 | 7 | 4 | 3 |
| 1 | 8 | 4 | 4 |
| P House : | | | |
| 1 | 9 | 5 | 4 |
| 1 | 9 | 6 | 3 |
| 1 | 7 | 4 | 3 |
| 1 | 7 | 4 | 3 |
| Q House : | | | |
| 2 | 14 | 8 | 6 |
| 2 | 14 | 10 | 4 |
| R House : | | | |
| 1 | 7 | 4 | 3 |
| 1 | 8 | 6 | 2 |
| 1 | 8 | 6 | 2 |
| 1 | 7 | 5 | 2 |
| Total - | 344 | 220 | 124 |

This table exhibits the deficiency of accommodation in the permanent barrack-rooms.

The cubic space in these rooms will not divide equally into portions of 600 cubic feet, and the number 220, which we have adopted as representing the maximum accommodation, gives less than 600 cubic feet per man. In not exacting the full reduction, we have been guided in this, as in other similar cases, by the lofty, airy position of the buildings.

The four casemates have regulation accommodation for 15 men each, or 60 men in all, while the cubic space, at 600 feet per man, is barely sufficient for nine men each, giving a total accommodation for 36 men instead of 60.

The huts are of the usual dimensions, and are constructed for 25 men, with 258 cubic feet per man. We propose to reduce the numbers to 20 men per hut, and not to exact the full space, for reasons we have

frequently stated in preceding reports—namely, that subdividing men into small numbers among separate buildings of porous construction, and admitting of easy ventilation, is found in practice to answer the ends aimed at in giving the larger cubic space in permanent stone buildings.

None of the barrack-rooms are ventilated, and all require additional light.

For improving these buildings, we would propose that the earth be cut away from the back wall of the rooms, so as to lower the ground at least 12 inches below the level of the floor of the lower rooms, and to lay a flagged gutter, to ensure that the surface water be carried away from the buildings. We would propose to remove all the windows from the corridor on the southern face of the barracks, and to enlarge the corridor windows, so as to convert the present closed corridor of each flat into an open arcade, giving access to the rooms. Additional windows should be made out of each barrack-room into the corridor, so that each room may have windows on opposite sides.

Every barrack-room in the fort with windows only on one side should have a window opened on the opposite side of the room, where practicable.

Every barrack-room requires ventilation by a shaft carried from the ceiling of the room above the roof of the building, and by inlets for air near the ceiling, covered internally by perforated zinc cornices, to diffuse the air within the room.

The casemates have some ventilation by a channel communication with the open air. We would propose to give additional ventilation, in this case, by inserting a silk flap ventilator into the chimney of each casemate, and by panes of perforated glass inserted into the circular window over the door.

The huts also require additional ventilation by a circular space through the roof round the stove pipe, and by louvred openings in the gable ends above the doors.

All the rooms are warmed by the large open grate of the usual construction. A more economical grate ought to be supplied.

There is no day-room, school-room, nor library in in the fort.

There is one ablution-room on the ground floor of the main building. It is dark and not properly drained, besides being in other respects very objectionable. It is also at a considerable distance from other parts of the barracks.

We would propose to improve the lighting and drainage of this ablution house, and to limit its use to the men in the building where it is situated; and we would propose that one or more ablution houses be constructed in such a position as to be easily accessible from the other quarters within the fort.

There are no baths. One bath is required for every 100 men.

There is no laundry, but only a very bad wash-house, situated in the ground floor of the main building, at the end opposite the ablution house.

It is dark, damp, and unventilated. It is not drained, and all the soap-suds are thrown into a gutter which runs along the narrow space behind the barrack-rooms, where the foul water lies and becomes putrid. This nuisance is above the level of the floors of the ground-floor rooms, and exactly under the barrack-room windows. Moreover, the only access to the wash-house is along the gutter and past the range of men's windows.

There are no means of washing in the place except boilers.

We would propose to remove this wash-house altogether, and to construct a proper laundry, in some fit locality.

There are no married quarters, and women have to be accommodated in men's rooms, about four families to a room.

There is one kitchen, with 10 boilers, and no other means of cooking.

It is at too great a distance from some of the barracks to admit of the dinners being delivered hot. It is insufficiently lighted, and defectively ventilated.

We would propose that the present kitchen be supplied with a suitable roasting oven; that an additional window, with perforated glass panes, be put in; that the roof ventilation be increased; and that another kitchen be built in a convenient situation for the quarters requiring it.

There are no cleaning-rooms, and no drill shed. There are no shops, excepting that for the armourer.

The water supply is derived from three soft water tanks, with pumps, and one hard water tank.

One of the sources supplies water which is unfit for any culinary purpose. The supply is reported to be scarce in summer. The whole of the roof water is not collected, as it ought to be, in order to supply soft water for washing.

The drainage is very defective, or rather, in the proper sense of the term, there is no drainage at all, as all the privies are without water or drainage, and the soil of the men's privies empties into the ditch, while that from the women's privy empties into a cesspit close to the barrack. The ditch requires drainage, as it is occasionally very offensive.

The privies have no divisions of seats, and they are deficient in light and ventilation. They are in a most offensive and noxious condition.

Nothing will remedy these defects short of the entire reconstruction of all the privies as water latrines, with drainage to the sea. They should have sufficient light and ventilation, as well as divisions of seats and half-doors.

Properly constructed urinals, supplied with water, are also required.

There is an open ash-pit under the windows of the barracks which ought to be removed, and all the barrack refuse ought to be taken away daily, for which there are abundant facilities in such a locality.

The canteen was originally a soldiers' house; it has neither store nor cellar. The tap-room requires ventilation into the chimney, and perforated glass panes in the windows.

The guard-room is small for the number of men on guard, and the guard bed is arranged in a double tier. There is only one window, and the place is very dark. It requires an additional window, and a shaft and inlet for ventilation.

The lock-up room is too small.

The cells require warming.

*The following is a Summary of the Sanitary Improvements required for Charles Fort:—*

1. Reduction of the numbers of men in the barrack-rooms, casemates, and huts, to the extent specified.

2. Ventilation of each of the barrack-rooms by a shaft and two inlets for air. Ventilation of the casemates by silk flap ventilators into the chimnies, and by perforated glass panes in the circular windows. Ventilation of the huts by circular openings round the stove pipes, and by louvred openings in the gables. Ventilation of the guard-room by a shaft and inlet. Ventilation of the canteen tap-room by a silk flap ventilator into the chimney, and by perforated glass panes in the windows.

3. Cutting away the earth behind the upper range of barrack-rooms, to a depth of 12 inches below the level of the ground floor; and flagging the area for drainage. Converting the corridor into an open arcade, and opening windows into it from all the barrack-rooms. Opening additional windows in other barrack-rooms, on the side opposite the present windows, where practicable.

4. Draining and improving the present ablution house, by laying on water, and constructing additional ablution accommodation for the other barrack-houses. Providing one bath for every 100 men.

5. Removing the present women's wash-house, and constructing a proper laundry in another situation.

6. Providing an additional cook-house, with means of boiling and roasting meat. Providing a roasting

oven for the present cook-house, and giving it additional light by a window, and also ventilation through the roof.

7. Converting all the privies into water latrines, with drainage to the sea, with light, ventilation, divisions of seats, and half-doors. Providing urinals, properly supplied with water. Removing the ash-pit, and abolishing all cesspits. The ditch also to be drained.

*Charles Fort Hospital.*

This building is very unsuitable for its purpose.

It consists of two parts, separated from each other by a roadway. One of these contains four hospital wards; the other, on the opposite side of the road, contains the surgery, pack store, and hospital-serjeant's room.

The following is the accommodation, compared with what it would be at 1,200 cubic feet per bed:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Bed Spaces. |
|---|---|---|---|
| 2 | 12 | 4 | 8 |
| 2 | 12 | 4 | 8 |
| Total - | 24 | 8 | 16 |

There is room for eight beds, giving somewhat more than 1,200 cubic feet per bed. It need hardly be stated, that the accommodation is entirely inadequate for the strength.

The wards are only 8 feet 6 inches and 8 feet 9 inches high, and they are not ventilated.

The upper sashes of some of the windows do not open properly. There is no ablution or bath room. There is no water-closet, but only an offensive privy and cesspit in the hospital yard. The dead-house is a cellar under one of the wards, and is said to be so much infested with rats, that when a corpse is laid there it is necessary to keep a watch over it.

The kitchen has not sufficient means of cooking hospital diets.

The building is so unsuited for a hospital, that it can only be considered as a mere refuge from the barrack-room. If it is considered necessary to have a proper hospital in the Fort, such a hospital should be constructed. There is plenty of space for it. It might be desirable, however, to consider whether, as a new hospital is required for Kinsale barracks, it would not be advisable to make provision in it for the sick of Charles Fort; in which case the present building in Charles Fort could be made available as a temporary resort for slight cases, until they could be removed to Kinsale.

*With this view, we would recommend:—*

1. That the regulation number of beds be reduced to the extent specified.
2. That each ward be ventilated by a shaft and inlet for air, like the barrack-rooms.
3. That a water-closet, bath, and ablution-room be attached to the building, and the present privy and cesspit abolished.
4. That a cooking range be supplied to the kitchen.

## IV.—TRALEE.

### Infantry Barracks.

These barracks are of stone, and were erected in the year 1812. They are situated at a short distance from the town of Tralee, in an open healthy situation, with only a few cabins and detached houses near them. The area within the barrack enclosure is 15A. 3R. 12P. in extent, a small portion of which only is occupied by buildings. A large part of the ground is laid down in grass, and let for feeding cattle, so that, notwithstanding the extent of the exercising ground, the men cannot obtain the benefit of it. This most objectionable arrangement ought to be terminated as soon as possible, and the barrack ground restored to barrack purposes.

The underlying rock of the district is limestone, but the immediate subsoil on which the barracks stand is porous, and, during high tides, the well water is apt to become brackish in consequence. A small but rapid stream of water flows past the east gate of the barracks, and empties itself into the tideway, at a distance of about three-fourths of a mile. This stream is the natural outlet for the barrack drainage.

The men's barracks face the south-west. They occupy two blocks, divided by an archway and clock tower. The officers' quarters occupy two detached blocks of buildings, one at each end of the men's barracks, and placed at right angles to them. There is another range of buildings, partly used as officers' quarters, partly as hospital wards, running parallel to and behind the eastern range of officers' quarters. The cook-house, ablution-rooms, wash-house, &c., are placed immediately behind the soldiers' rooms, and in the same line there are seven barrack huts, occupying a considerable area of the small space behind the barracks.

The hospital is situated at the eastern corner of the barrack enclosure. On the same side are placed the fives-court, provost establishment, and women's drying ground. The chapel school is situated in the large grass field in front of the soldiers' quarters.

These quarters are two stories high, and, as already stated, they consist of two blocks. The blocks are divided into houses, each of which is entered from without by a door opening into a short passage, leading to a barrack-room on each side, and nearly opposite the outer door is the entrance to a serjeants' room. The upper flat is arranged in a similar manner.

The barrack-rooms run through from front to back of the building. Each room has four windows, two on each of the opposite sides. In the end rooms the windows are placed on three sides.

The men's rooms have all the same cubic capacity, and have regulation accommodation for 17 men per room.

The total accommodation, compared with what it would be at 600 cubic feet per man, is as follows:—

| Rooms. | Regulation Accommodation in Men. | Accommodation at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 23 | 392 | 253 | 139 |

The large deficiency of accommodation which this table shows, indicates a considerable degree of overcrowding in the present regulation numbers. Each man has less than 400 cubic feet, and to give, as near as may be, the required 600 cubic feet will necessitate the reduction of the regulation number per room from 17 to 11, which we would recommend to be done.

There is abundance of space within the enclosure to admit of these barracks being extended, but as the officers' quarters are well situated for extending the barrack accommodation, perhaps the best way would be to build new officers' quarters, and to convert the present ones into barracks.

The barrack accommodation has been added to by constructing seven huts, each capable of holding 25 men by regulation. This number is too many, and it ought to be reduced to 20, as the maximum number each hut should contain. Each of these huts is ventilated through the boarded ceiling and roof, and warmed by a stove.

The ventilation in the barrack-rooms is provided

for by hanging the upper window sash on pivots, and by a small opening above the door into the staircase. This latter is not sufficient when the windows are shut. The required ventilation can, however, be very easily provided, as follows :—

Each barrack-room has two fireplaces, at opposite ends of the room, only one of which is necessary, and the other is not used. The chimney of this disused fireplace should have an opening double its sectional area made into it near the ceiling, and covered by a grating. This will afford the required outlet for foul air. To supply fresh air two air bricks should be inserted, one on each side the room between the windows, and they should be each covered with a perforated zinc cornice for diffusing the air. The fire-grate should be, at the same time, remodelled, to save heat, a large proportion of which is at present lost up the chimney.

The barrack is lit with candles, instead of which gas should be introduced, and a ventilated gas-burner placed in every room whenever gas is available for the purpose.

There is no day-room, cleaning-room, nor covered drill shed.

There is a chapel school, of wood, already mentioned. It requires additional ventilation through the roof.

There is no permanent library, but one of the wooden huts is used for containing books.

There is only one lavatory, sufficient for about 48 men to wash in at a time. The room is well lighted, and has every requisite except baths. It is rather too small for the size of the barrack.

A bath-room with four baths is required, and, in providing this, additional lavatory space might be obtained.

There are no sufficient means of washing the men's linen. There is a small, dark, narrow women's wash-house, with two coppers, but it has no drying stove nor means of getting up linen. This wash-house should be enlarged, lit through the roof, and suitably provided with requisites.

There are two cook-houses, each containing 14 boilers. There are no other means of cooking. One of the kitchens has no ventilation, and no means of carrying off the steam. This defect should be remedied, and a roasting oven should, at the same time, be put up in each kitchen.

The privies of this barrack are in a very offensive state, and drain into large cesspits. In the enclosure of the barrack stores, the barrack-serjeants' privy, and the officers' privy, empty into an open ash-pit, in a most noisome state. There is a privy belonging to the provost establishment, which empties into a cesspit in the small prison yard, over which the prisoners take their exercise. The buildings of the soldiers' privies are neither lighted nor sufficiently ventilated, and the whole of these arrangements throughout the barracks require reconstruction.

This must be done in connexion with the barrack drainage improvements.

The outlet for the required latrine drainage can be readily obtained by carrying it across the highway to the small river already mentioned, and when this is done the present privies should be given up, and water latrines, with divisions of seats, half-doors, light, and ventilation, should be constructed in more convenient positions than the present one. All the cesspits ought at the same time to be abolished.

The surface drainage near the barrack-buildings is defective, on account of the nature of the paving and guttering, the former of which is done with boulders.

These boulder pavements should be removed by degrees from the vicinity of barrack-room walls, and a strip of flagging should be carried along the side where the entrance doors are, at least. Square setts, closely joined, may be used where flag-stones are too expensive.

The guttering should, at the same time, be improved, and all the drains effectually trapped.

Water is obtained from two wells with pumps. It is good, except at certain times of high tides. In such a locality, any required amount of water can be obtained, but tanks at a sufficient elevation are requisite for filling and flushing the latrines. The roof water might be advantageously used for the lavatories and women's wash-houses.

These barracks, like so many others, have no accommodation for married non-commissioned officers or soldiers, and there is no mess-room for non-commissioned officers. A 17-men room is misappropriated for this latter purpose.

There is no regimental store-room, and another barrack-room is used as a store-room.

The guard-room adjoins the orderly-room. The guard-room is not near the gate, and the orderly-room is at some distance from the barrack. There is no lock-up attached to the guard-room, so that the soldiers on guard are in the same room with the prisoners. This room requires a shaft, with louvres for ventilation, and a remodelled grate to save heat.

The accommodation for trades is defective, and of a temporary character. If the barrack is to be extended, proper workshops should be provided.

*The Sanitary Improvements required are as follows :—*

1. Reduction of numbers of men in the barrack-rooms and huts to the extent stated, which can be effected at once, by the erection of additional huts in front of the barrack.

2. Ventilation of every barrack-room, by an opening made into the disused chimney, of double the sectional area of the chimney.

Inlets for air, with perforated zinc cornices, to be made between the windows. Grates to be remodelled. The guard-room to be ventilated by a shaft, and the grate to be remodelled. Chapel school to have additional roof ventilation.

3. Bath-room, with four baths, and water laid on, to be constructed. This room to contain additional lavatory space.

4. Barrack drainage to be improved as stated ; all cesspits to be filled up, and all privies to be reconstructed as water latrines, with drainage and means of flushing, divisions of seats, half-doors, light, and ventilation. Surface drainage and paving to be improved, and all drains to be trapped. Urinals to be supplied with water.

5. A roasting oven to be erected in each kitchen, and one of the kitchens to be ventilated as suggested.

6. Women's wash-house to be fitted up with fixed tubs, gratings, &c., and to have a drying and a laundry stove provided.

7. The use of the ground within the barrack enclosure should be restored to the men.

Lastly. The other requirements as to married quarters, a day-room, cleaning-room, and covered drill shed, &c., should also be supplied.

*Tralee Barrack Hospital.*

This is a very defective hospital. Twelve years ago it was reported as unfit for sick, but it is still used.

It is a small house, of the usual hospital model, two stories high, with a staircase up the middle, with kitchen, surgery, store-room, and serjeant's-room, down-stairs, and two wards above.

The wards are small, and contain nine beds each, 18 beds in all, on the present construction.

At 1,200 cubic feet per bed the wards would hold four beds each ; so that the building has accommodation for no more than eight sick.

It has neither lavatory, bath, laundry, nor water-closet. There is no proper kitchen range, and no

oven. The drainage is most defective. The sick have to make use of an open privy, but to reach it they have to walk across the court in the open air in all weathers.

The accommodation which this building has afforded has hitherto been so defective that it has been found necessary to misappropriate rooms in the officers' quarters for the reception of sick.

The wards have openings in the ceilings for ventilation, but these are insufficient. Each ward has two fireplaces, one of which is not used. The chimney shaft of this fireplace might be rendered available for ventilation, by making an opening into it, as has been recommended for the barrack-rooms. Two panes of perforated glass introduced, one into a window on each side of the ward, would give the requisite amount of inlet for fresh air.

In the rooms in the officers' quarters misappropriated for sick, an air shaft should be carried from the ceiling through the roof of the building, and perforated glass panes put into the windows.

These improvements would be useful, even if the building were turned to other purposes. We would strongly advise that a new hospital be built.

Until this can be done, we would recommend that nothing more than the most necessary improvements for health should be carried out.

*These are as follows:—*

1. Reduction of beds to four in each ward of the hospital, and allotting 1,200 cubic feet per bed in the sick rooms in the officers' quarters.

2. Ventilation of wards, both in the hospital and in the officers' rooms misappropriated for sick, as suggested.

3. A suitable kitchen range, for cooking diets.

4. Improving the drainage and constructing a watercloset connected with the wards.

## V.—BUTTEVANT.

### Infantry Barracks.

This barrack has regulation accommodation for 946 non-commissioned officers and men. It is situated within an enclosure, 11 A. 3 R. 8 P. in area, in an open situation at one end of the town of Buttevant. A branch of the Blackwater river runs past the barrack, close to the boundary wall; and the gravelly, porous ground on which the buildings stand is not much raised above its level.

The barracks are built of stone, in a double square. They were erected in 1810. Four sides of one square are occupied by soldiers' houses. Two of the sides are continued beyond this square to form officers' quarters, and the second square is completed by the guard-room, chapel school, and by some wooden huts.

The men's barracks consist of six similar blocks, each of which is two stories high. The blocks are divided into houses, each containing four barrack-rooms and two serjeants' rooms. These houses are entered by a doorway opening into a short passage, from which access is gained to a barrack-room right and left, and to a serjeants' room and staircase. The latter is of stone, and leads up to a passage above, out of which two barrack-rooms and a serjeants' room enter in a similar manner. Each barrack-room has four windows, two on each of the opposite sides. It may be here stated, that complaint was made to us that the new pattern iron shelves which have been introduced into these rooms, have the bars too wide apart, and that articles laid on them fall through. They are also placed so high that, as we were informed, the men have to stand on their beds to get at them.

The rooms are of four different sizes, and accommodate some 15, some 10 men. The following table shows the total accommodation by existing regulation, and also the amount at 600 cubic feet per man.

| Rooms. | Total Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency in Accommodation in Men. |
|---|---|---|---|
| 27 Lower | 405 | 297 | 108 |
| 25 Upper | 375 | 250 | 125 |
| 7 Lower | 70 | 49 | 21 |
| 6 Upper | 60 | 42 | 18 |
| Total 65 - | 910 | 638 | 272 |

There is accommodation in these barracks for no more than 638 men, and it will be necessary to reduce the numbers in the rooms to the following extent:—

Out of every room in the first set in the table four men will have to be removed. Five men will have to be removed out of every room in the second set, and three men out of each room of the other two sets.

There are 36 non-commissioned officers' rooms. There are no separate quarters for married people.

None of the rooms have sufficient ventilation, a defect which can be easily and economically remedied. Every 15-men room has two chimnies, one at each end. Only one of these chimnies is in use for warming, and the other should be converted into a ventilating shaft, by making an opening into it close to the ceiling. The aperture should have double the sectional area of the chimney, and should have a grating placed over it. There is an opening above the door for admitting fresh air at present, but it is of no use. It will be requisite to insert an air brick close to the ceiling, between every two windows, on the opposite sides of each room, and to diffuse the air entering the room through a short cornice of perforated zinc.

The small 10-men rooms have only one fireplace each. They will require a ventilating shaft, carried up from the corner of the room to above the roof, and to have an inlet through an air brick, with a perforated zinc cornice.

Every non-commissioned officer's room ought to have a silk flap ventilator inserted in the chimney.

Besides the accommodation in these permanent barracks, there are four wooden huts, with regulation accommodation for 25 men each. It will be necessary to reduce the numbers from 25 to 20 men.

All the rooms are at present warmed by the old pattern grate, which wastes much heat. The grates should be remodelled, to save fuel.

The barrack-rooms are lit with candles. Gas is not obtainable at present.

There is no day-room for the men.

There is a good chapel school. Its warming and ventilation are, however, defective, but could be easily improved by admitting fresh air by a grating under the stove, and by ridge ventilation, or by making the small window in the gable-end over the door to open. The schoolmaster's house is deficient in light, from the window sills not being low enough. This could be easily remedied.

There is no latrine or urinal for the children or officers connected with the school. This is a common defect in these chapel schools, and is felt to be a great inconvenience.

There is one room appropriated as a library, which should be ventilated in the same manner as recommended for the barrack-rooms.

The barrackmaster's stores are complained of as being deficient, and the regimental stores as being damp and unventilated. These defects require remedy.

There are two lavatories, one on the north-east,

the other on the south-west side of the barrack, capable of accommodating 60 men at a time.

These ablution houses are at a considerable distance from many of the soldiers' rooms, and the men are unnecessarily exposed in going to them imperfectly clothed. The lavatory accommodation is too small for the force, and might be advantageously increased by adding two other ablution-rooms near those parts of the barracks most distant from the present lavatories.

The lavatory on the north-west side is roofed over by an iron tank the entire size of the roof. As the iron is directly over the men's heads, it makes the whole interior very cold in cold weather. This should be remedied by a boarded ceiling.

Pegs are required in this lavatory, otherwise its arrangements are sufficient.

The lavatory on the south-west side is good and sufficient.

The only bath in the barracks, one which has been constructed quite recently, is situated in this ablution house ; but the men do not like the trouble of using it, on account of the kind of water-tap adopted. It supplies water slowly, and requires to be pressed down and held until the bath is full. This, which forms a reasonable cause of complaint, ought to be remedied.

The taps in the ablution house have the same defect. Their object is to save water ; but for soldiers the common and simpler tap is, on the whole, the better.

It will be necessary to extend the bath accommodation, to give one bath to every 100 men. The best way to do this would be to introduce baths along with extended lavatory arrangements into the same building. Water to any extent, for baths and lavatories, may be obtained from the river.

There is no laundry. The women's wash-house is a narrow lean-to building, without the requisite means of washing and drying linen. It is not sufficient for such a barrack, and could hardly be rendered so. The best way to do would be to construct a proper laundry, with boilers, fixed tubs, drying closet, &c.; and as there is no proper meat store, the present wash-house might be used for that purpose.

Properly speaking, there are no kitchens belonging to these barracks. Two soldiers' rooms on the ground floor, with soldiers' rooms above them, have been fitted up with 10 boilers each, and are used for cooking.

The rooms above are, consequently, not fit for occupation as barrack-rooms, and hence four large rooms are required to enable two kitchens to be constructed in a position where they ought not to be placed. Besides which, these kitchens are at so considerable a distance from part of the barracks, that the men's dinners cannot be conveyed to their rooms without injury, especially in cold, wet, or dusty weather.

There is no oven in either kitchen. If these kitchens are to be retained, it will be necessary to erect a ventilated roasting oven in each, and to ventilate each kitchen by carrying a large wooden shaft from the ceiling to above the roof. Panes of perforated glass will also have to be introduced into the kitchen windows.

For the reasons stated, another kitchen, with suitable cooking arrangements, is required at the opposite end of the barracks. When this is erected, one of the present kitchens might very well be given up.

There are no cleaning sheds, covered drill sheds, or workshops. These are all required.

The water supply of this barrack is defective, and requires entire re-arrangement.

There are six pump wells, one of which is close to the river. Three of these wells are always dry, and of the remainder only one affords tolerable drinking water. There is a tank over the north-west ablution house, into which part of the roof water is conducted.

The river forms an inexhaustible source of supply, and any amount of naturally filtered water could be obtained from wells sunk close to it.

The water should be pumped up to a proper tank, and thence distributed to the kitchens, laundry, baths, ablution houses, hospital, latrines, &c.

The drainage of the barrack is defective. The parade ground becomes sloppy in wet weather, and requires to be under-drained. The privies all require drainage, but there is an apparent difficulty attending drainage which must be removed, and this is, how to dispose of the sewage.

The natural outlet is into the river, but it is stated that objections are raised against the drainage being discharged into it by the neighbouring inhabitants, and not without reason. By far the best way to dispose of the barrack sewage would be to irrigate meadow land with it, as has been done most profitably with part of the drainage of the barrack at Parsonstown. There is plenty of such land at a sufficient distance from the barrack, to which the sewage could be most advantageously applied, if the proprietor or tenant would take it. This point should be inquired into at once. Land for such irrigation should, wherever practicable, be selected on the side of the barrack opposite to that from which the prevailing winds blow, and at a distance not less than 500 yards from the barrack building.

If objections are raised against the application of the sewage for agriculture, the next thing to do would be to convey it away to a tank at a distance from the barrack wall, and there to filter or deodorize it, allowing the clear liquid to escape in the river, and the contractor would then remove the solid part. The whole quantity of sewage is so small, that it might be very easily disposed of in one or other of these ways.

Whenever the drainage is provided for, all the privies within the barrack boundaries ought to be reconstructed as water latrines, and all the cesspits filled up. Water-closets ought to be introduced into the officers' quarters, in which the privies are relatively as bad as are those for the men. The barrack privies had been cleansed with lime just before we inspected the barracks, but they were, notwithstanding, in a most offensive state, and tainted the air to some distance.

The proposed water latrines should all be provided with divisions of seats, half-doors, a proper amount of light, and ventilation.

The guard-room requires a shaft for ventilation, and the grate to be remodelled. The lock-up room is too small. It might be advantageously converted into two cells, and an additional lock-up room built.

The officers' quarters and mess are deficient in accommodation. The present buildings might be converted into married quarters or additional barrack accommodation, and new officers' quarters might be built, which would be, perhaps, the most economical method of remedying both deficiencies.

The arrangements for collecting and removing barrack refuse are defective. In crowded areas, where there is little space, iron carts, such as we have recommended for town barracks, answer best ; but for country barracks such as this, ash-pits, if used, should be very few in number. The bottom of each should be flagged, drained, and raised two or three feet above the level of the ground. All ash-pits should be placed at a distance from inhabited buildings, and arrangements made for daily removal of the refuse whenever it can be done.

*The following are the Sanitary Requirements for these Barracks :—*

1. Reduction of numbers in the barrack-rooms and huts, to the extent specified.

2. Ventilation of every barrack-room, by an opening into every disused chimney, when there are two chimnies to a room, or by a ventilating shaft where there is only one chimney ; and by inlets for air, with a perforated zinc cornice placed between the win-

dows. Fire-grates to be remodelled. Ventilation of the non-commissioned officers' rooms, by a silk flap ventilator into the chimney. Library to be ventilated by an opening into the disused chimney, and by an inlet, like the barrack-rooms. Guard-room and chapel school to be ventilated as described. A window to be made in the back wall of each staircase, and the windows in the schoolmaster's house to be enlarged.

3. Additional lavatory accommodation to be provided. Lavatory on the north-west side to have a wooden ceiling under the floor of the water tank above it. Pegs to be provided.

4. Additional baths to be provided, in the proportion of one bath to every 100 men.

5. A women's wash-house, with boilers, fixed tubs, and drying closet, &c., of an adequate size, to be provided.

6. Kitchens to have roasting ovens, and to be ventilated by shafts and perforated glass panes. One of the kitchens ought, if possible, to be placed in a more convenient position, as stated above.

7. Water supply to be re-arranged, to afford sufficient water for latrines, wash-houses, baths, &c.

8. Parade ground to be under-drained. Privies to be re-constructed, drained, and converted into water latrines, and the sewage disposed of in one of the methods mentioned. Latrines to be lighted and ventilated, and to have divisions of seats and half-doors.

Urinals to be supplied with water.

Lastly, married quarters, day-rooms, cleaning shed, covered drill shed, and workshops ought to be provided.

*Buttevant Barrack Hospital.*

The hospital is divided from the parade ground by a dwarf wall. It is inclosed to a sufficient extent by neighbouring high walls to have its external ventilation materially interfered with. It consists of two houses under one roof. Each house is intended for a separate hospital, and has a separate entrance, staircase, kitchen, surgery, &c. At the time of our inspection it was used as one hospital, and one of the kitchens was in use as a dining-room for convalescents.

The building contains in all nine wards, and has 81 beds. It is considerably overcrowded, as the following table will prove :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency of Accommodation in Beds. |
|---|---|---|---|
| No 1 | 9 | 5 | 4 |
| „ 2 | 9 | 4 | 5 |
| „ 3 | 9 | 4 | 5 |
| „ 4 | 9 | 4 | 5 |
| „ 5 | 9 | 5 | 4 |
| „ 6 | 9 | 4 | 5 |
| „ 7 | 9 | 4 | 5 |
| „ 8 | 9 | 4 | 5 |
| „ 9 | 9 | 4 | 5 |
| Total - | 81 | 38 | 43 |

At 1,200 cubic feet per bed (as near as may be,) the hospital has room for 38 beds, and the numbers per ward would require to be re-allotted in the manner pointed out in the table.

Six of the wards have two fireplaces each, one of which only is used. The remaining three wards have each one fireplace. All the wards have four windows, two on the opposite sides of the ward. There are, however, no sufficient means of ventilation. To provide for this defect, we would advise an opening, covered with a grating, having an area double the sectional area of the chimney, to be introduced into the disused chimney shaft in each room where there are two shafts. In the other rooms a ventilating shaft will have to be carried through the ceiling above the roof. Sufficient fresh air may be admitted by a perforated glass pane in the upper part of each window frame.

Each staircase should be ventilated by a shaft carried through the roof, and by perforated panes of glass in the stair windows. The staircases might be warmed during winter, if necessary, by means of stoves.

The ward grates waste much heat, and we would recommend their being remodelled.

The other accommodation in the hospital is very deficient. There are no rooms for the hospital-serjeant, cook, or orderlies. The former officer has two rooms misappropriated for his use, and the others sleep in the wards.

The wards are lit by candles. There is no bath-room, lavatory, or water-closet. An addition should be made to the building to contain these needful appliances of a hospital. A fixed bath, with hot and cold water laid on, is required.

There are two small privies in the back yard, with cesspits, very offensive and quite unsuitable for sick. One should be converted into a water latrine, properly drained, for the attendants, and the cesspits abolished.

The wash-house is very imperfect, and has no means of drying the patients' linen. A drying stove is necessary for this purpose.

The cooking arrangements are defective.

A new kitchen range is required for each kitchen, and as the kitchens are below the sick wards they require to be ventilated by shafts and perforated glass panes in the windows.

The water supply is defective, for the same reasons as that of the barracks, and should be improved at the same time.

There is no provision store, and a pack and bedding store has been formed out of a room taken off the construction for the purpose.

There is no hospital accommodation for the sick of soldiers' families.

*The following Sanitary Improvements are requisite :—*

1. Reduction of the number of beds in all the wards, to the extent specified.

2. Ventilation of all the wards by openings into the disused chimnies, where there are two, or by an air shaft in the wards with one chimney. A pane of perforated glass to be inserted into every ward window frame. Ward grates to be remodelled.

3. A building, accessible under cover, to be erected for a bath-room, water-closet, and lavatory for the sick, with a fixed bath, and hot and cold water laid on.

4. New kitchen ranges, with oven and hot plate, to be erected in the kitchens. A ventilating shaft to be carried up from the ceiling of each kitchen, and perforated glass panes to be placed in the windows.

5. Water supply to be improved, as described, and water tanks covered.

6. Cesspits to be abolished, and privy in the yard to be converted into a water latrine.

Lastly, the other requirements stated are also necessary, but they can only be properly carried out by extending the hospital.

## VI.—MALLOW.

### Infantry Barrack.

This is a small barrack, with accommodation for 90 non-commissioned officers and men. It is situated on the south side of the town of Mallow, on a slope, with a good fall to the river Blackwater, about 100 yards distant. The buildings occupy a single range, extending along the upper end of the parade ground, close to the boundary wall, which is sufficiently high

to prevent anything like free ventilation on that side of the barrack.

There are two houses occupied by soldiers' rooms, one house for officers' quarters, and the hospital, all in the same line, but the hospital is thrown back, and has a narrow court-yard in front.

The buildings are two stories high. In the soldiers' houses the larger rooms face the parade ground, and there are smaller rooms facing the boundary wall. The former are tolerably good, the latter are unfit for barrack-rooms. Each room has only a single window, and there are no means of thorough ventilation.

The following table shows the present regulation accommodation in these barracks, in comparison with what it would be at 600 cubic feet per man :—

| Rooms. | Total Regulation Number of Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| B House : | | | |
| 1 | 8 | 4 | 4 |
| 3 | 8 | 4 | 4 |
| 5 | 10 | 6 | 4 |
| 6 | 8 | 5 | 3 |
| 7 | 3 | 1 | 2 |
| C House: | | | |
| 1 | 9 | 5 | 4 |
| 2 | 3 | 1 | 2 |
| 3 | 9 | 5 | 4 |
| 4 | 3 | 1 | 2 |
| 5 | 8 | 5 | 3 |
| 6 | 4 | 2 | 2 |
| 7 | 12 | 6 | 6 |
| 8 | 3 | 1 | 2 |
| Total - | 88 | 46 | 42 |

The deficiency of accommodation in this barrack amounts, therefore, to nearly one-half. The three-men rooms are only fit to accommodate one man each ; they are, in fact, small bed-rooms rather than barrack-rooms. They have no fireplaces, and consequently no means of ventilation.

As already stated, all the rooms are deficient in ventilation, and all require a ventilating shaft to be carried up from the ceiling in one of the corners opposite the window, to above the roof. An inlet for air, through a short cornice of perforated zinc, is also required above the window.

The fire-grates waste a large part of the heat, and might be very advantageously reconstructed on a better plan.

The barrack is lit by candles. There is neither day-room, school-room, nor library.

There is neither lavatory, bath-room, nor laundry. One of the cook-houses is occasionally used as a wash-house. It is certainly unsuited for answering both purposes.

There is no accommodation for married soldiers.

There are two kitchens, one in each house. They are placed under the small barrack-rooms, and open on a narrow damp back yard. Each kitchen has two boilers, but no other means of cooking. A roasting oven ought to be erected in one of the kitchens.

There is neither cleaning-room, drill shed, nor accommodation for trades.

Water is obtained from a pump well. There is a rain-water tank also, into which part of the roof water is collected. It will be necessary to economize this water for improvements we are about to suggest in the latrines, and to construct a suitable tank.

The latrines are situated at a short distance from the barracks. They are merely open privies emptying into cess-pits. They require reconstruction as water latrines, with suitable drainage, and with divisions of seats and half-doors.

The guard-room requires ventilation by a large silkflap ventilator into the chimney, and by a remodelled grate for warming part of the admitted air.

It will be perceived that this small barrack is very deficient in some essential requirements for health. Its structure is bad. The rooms are overcrowded, and without ventilation. Several of them are hardly fit for occupation. The cook-houses are within the barrack buildings, and in close proximity with the sleeping rooms. The drainage and water supply are also defective.

Considering the small size of the barrack, we are not disposed to recommend that much money should be spent on it, more especially as the whole question of these small barracks in Ireland will no doubt be reviewed by the military authorities, with special reference to which of them should be retained and which given up. This barrack was occupied at the time we inspected it, and we must therefore deal with it as it is.

*Restricting our Recommendations to those barely necessary for Health, we would advise as follows :—*

1. Reduction of the numbers of men in each room to the extent stated.

2. Ventilation of each barrack-room by a shaft and inlet for air. Ventilation of guard-room by a large silk-flap ventilator into the chimney. Fire-grates in the barrack and guard-rooms to be remodelled. Kitchens to be ventilated by a shaft carried up above the roof of the barrack, and by glass louvres in the windows.

3. A lavatory and bath-room, with one bath and water laid on, to be constructed.

4. A roasting oven to be provided for one of the kitchens.

5. A proper wash-house, with boilers, fixed tubs, and drying stove, to be provided.

6. Privies to be reconstructed as water latrines, with suitable drainage, and water laid on.

7. Water supply to be increased, to enable these improvements to be carried out.

*Mallow Barrack Hospital.*

This is a small, confined, badly constructed hospital, not at all fit to receive serious cases of disease. It is situated at the end of the barrack range nearest the public road, from which it is separated by a high wall, cutting off the ventilation on that side. In front of the hospital, and between it and the barrack parade, is a small damp court-yard, with a high wall in front. The end of the barrack range completes the enclosure.

The front of the hospital is therefore effectually cut off from free external ventilation. In this narrow enclosed court is placed a privy, draining into an ash-pit. Directly behind the hospital, and bounded by its back wall, is a very foul pigsty ; and, passing under the end of the hospital is an open street drain, which was both filthy and offensive at the time we saw it.

The building itself is destitute of the most ordinary conveniences. It has no accommodation for hospital attendants. It has neither lavatory, bath, laundry, nor kitchen. It has no water-closet for the sick. It has neither provision store, bedding store, nor dispensary.

It is nothing, in short, but a badly situated, badly constructed house of two flats, on the ground floor of which are dark, damp, unhealthy quarters, occupied by the barrack serjeant ; and above are two dark, overcrowded, unventilated bed-rooms, used as sick wards.

The following is the present accommodation in

these wards, in contrast with what it would be at 1,200 cubic feet per bed :—

| Wards. | Present Regulation Accommodation. | Accommodation at 1,200 Cubic Feet per Bed. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 4 | 2 | 2 |
| 2 | 4 | 2 | 2 |
| Total - | 8 | 4 | 4 |

Bad as it is, something may be done to improve this hospital. We would propose :—

1. To throw down the front wall separating it from the parade ground, and to put up an iron railing instead.

2. To remove the privy and ash-pit out of the yard.

3. The law ought to be put in force, and the pig-sty behind the hospital removed. This is absolutely necessary.

4. The open drain which passes under the hospital ought to be converted into a proper sewer, and deviated from the building.

5. The barrack serjeants' quarters ought to be removed from the building, and the present apartments rendered fit for hospital purposes.

6. A bath and properly drained water-closet should be provided, and a kitchen range put up.

7. Additional light should be provided in the wards, by opening more windows, and the wards ought to be ventilated by large silk flap ventilators into the chimnies, and by perforated glass panes in the windows. The fire-grates also require to be remodelled.

8. No more than two beds ought to be placed in each of the present wards.

## VII.—FERMOY.

There are two large barracks at this station, situated on a table-land overlooking the town of Fermoy, called the New barrack, and the Cavalry and Old barrack. The local position of both barracks is very good and healthy, and their natural means of drainage ample ; but close to their boundary walls there is some extent of cottage property, in a very defective sanitary state. Part of this property comes within 20 feet of the boundary walls of the new barrack, at the eastern gate, but the greater part of it is close to the western entrance gate of the Old barrack, and along part of the west side of its boundary wall. In other respects, both barracks are in the open country.

Both barracks are situated in the same line, and nearly at the same elevation, and they are at a short distance from each other. The river Blackwater, which flows through the town of Fermoy, is in the valley, about 800 yards from the barracks, and is the natural outlet for the drainage.

The subsoil on which the barracks are built consists of stiff clay, with limestone rock at the depth of 35 or 40 feet from the surface. We shall report the details as regards each barrack separately.

### 1. Fermoy New Barrack.

This barrack stands within an area of 14A. 2R. 37P. It is built of stone, and was erected about the year 1809. Some of the outbuildings were added within the last ten years.

The barrack consists of three long ranges of blocks detached from each other. One of these ranges, occupied as officers' quarters, faces the south, and forms the north side of the parade ground. The soldiers' barracks are in the other two blocks, built at right angles to the officers' quarters, and form the east and west sides of the parade ground, which is open to the south. The whole arrangement of the buildings is good, and affords abundant means of external ventilation. Behind each soldiers' range are situated the cook-houses, lavatories, privies, &c., and behind the officers' quarters are situated the provost establishment, magazine, &c.

The barrack is three stories high, and the men's rooms are situated in nine houses, each having a good light stone staircase running up its centre, with the barrack-rooms opening right and left of it. The entrance passage runs right through the house, an arrangement which greatly facilitates the ventilation of the buildings ; but as these stairs and passages connect all the rooms in each house, it would be very advisable to ventilate each staircase by a shaft in the roof and by perforated glass panes in the windows.

The south end of the soldiers' ranges is made to project at right angles to the main line of the buildings, apparently to give greater breadth to the façade ; and in this projecting part are several barrack-rooms, which have no entrance except through another barrack-room communicating with the staircase. This is a structural defect, which interferes with the efficient ventilation of both rooms, otherwise the rooms are good. Every one of them has four windows, two to the front and two to the back. The windows are a good size, and the rooms are light and cheerful. In each stair there are three serjeants' rooms entering from the passage or half landing.

The total regulation accommodation afforded by this barrack is for 1,182 non-commissioned officers and men. The barrack-rooms are of four sizes. The following table exhibits the present regulation accommodation for soldiers, compared with what it would be at 600 cubic feet per man :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 42 | 672 | 462 | 210 |
| 21 | 336 | 210 | 126 |
| 8 | 96 | 64 | 32 |
| 4 | 48 | 28 | 20 |
| Total - | 1,152 | 764 | 388 |

By giving rather less than 600 cubic feet per man, these barracks can accommodate no more than 764 men. Hence the regulation number exceeds the accommodation at 600 cubic feet per man by 33 per cent.

To effect the necessary reduction of numbers, it will be requisite to remove five men out of each of the first group of 42 rooms, from A to E, in the preceding table. Six men will have to be removed out of each of the 21 top rooms, the second group in the table. Out of each of the next group of eight rooms, in U and V, four men will have to be removed, and five men will have to be removed out of each of the remaining four rooms in U and V.

None of the rooms are ventilated, and to effect this necessary improvement each room will require a shaft to be carried up from the ceiling to above the roof, and an opening for admitting fresh air should, at the same time, be made between each pair of opposite windows, close to the ceiling. A short perforated zinc cornice should be placed over the opening, to diffuse the air entering the room. In most other barracks we have visited in Ireland there have been two fireplaces in each barrack-room, the chimney of one of which affords the best shaft for ventilating the room. In these barracks there is only one fireplace, but in the wall opposite to it there is an appearance as if a chimney shaft had been carried up in the thickness of the wall. This should be ascertained, because if a shaft exists, all that is required is to make an opening into it close to the chimney, of

double the sectional area of the chimney shaft, and to cover it with a grating of the same size. If there is no second chimney, a separate air shaft will have to be introduced as described.

The grates in all the barrack-rooms might be advantageously remodelled to save heat.

All the serjeants' rooms are unventilated, and require a silk flap ventilator into each chimney.

The barrack is lit by candles. Gas can be obtained, and we would recommend that a ventilated gas-burner be introduced into each barrack-room and serjeants' room.

There are no day-rooms for the men. They are very much required. They should be properly warmed, lit with gas, and provided with means of amusing the men.

There is one school-room.

There is no library in this barrack, although there is one in the adjoining old barrack.

There are three lavatories in the rear of the soldiers' quarters. They are good and sufficient, except that the one behind the eastern range has no ledge to the table. A few perforated glass panes in the windows would improve the ventilation.

There are no baths, a means of cleanliness much required. A bath-house ought to be provided, with a bath for every 100 men, and water laid on.

There is no proper laundry, but there are four women's wash-houses, fitted up with benches and boilers. There are no fixed tubs, and no laundry or drying stoves. The accommodation for washing and getting up men's linen in so large a barrack is incomplete, and requires to be extended and improved.

There should be fixed tubs, with water laid on, a drying closet, and laundry stove, with means of ironing linen.

There are three cook-houses, supplied with boilers, but there are no other means of cooking meat. These cook-houses are not sufficiently lighted nor ventilated. These defects require to be remedied by louvres and skylights in the roof. Roasting ovens should likewise be supplied to each. The present cook-houses are stated to be rather small for so large a barrack, but they would not be so when the numbers of men are reduced, as recommended above.

There are two cleaning sheds, one for each side of the barrack.

There is no covered shed for drill.

There is an armourers', tailors', and shoemakers' shop. The two latter require ventilation by an air shaft and inlets, like the barrack-rooms.

The water supply is derived from five wells of considerable depth. The water is good and sufficient at ordinary times, but sometimes it falls short. Part of the rain water is received into tanks, and is used in the ablution-houses.

A large quantity of water will be required for carrying out the drainage works at this barrack, which will have to be obtained either by improving the supply from the wells or by bringing water from a distance. The propriety of doing so has been already under consideration; and it is stated that a copious spring of good water exists on the opposite side of the river, which might easily be brought over the bridge and up the slope to the barracks, which it would supply by gravitation alone.

The barrack is surface drained, but there is no privy drainage. All the present privies are very offensive, and are placed over cesspits. They require reconstruction as water latrines, with drainage, divisions of seats, and half-doors, and the cesspits should all be done away with. The barrack-master states that more accommodation in the way of latrines is wanted. It might be well, therefore, in reconstructing the present ones, to consider the question of providing additional accommodation in convenient localities.

All the urinals require water to be laid on.

There is no accommodation at present for married soldiers, although there is plenty of space where married quarters might be erected.

The guard-room requires ventilation through the roof, and a remodelled grate. There is no lock-up attached to it, and the prisoners are kept in the same room with the soldiers. This defect should be remedied. There is no latrine at the guard-room, and the barrack latrines are too far away.

The provost establishment is very good, but it requires a water latrine and suitable drainage. The present privy drains into the ash-pit. It is in dangerous proximity to the magazine; and the prisoners exercising ground, which is beside the magazine, has no gate, so that prisoners could escape into the barracks.

There is no ball court, or other means of exercise.

The canteen is very small and defective. It requires ventilation by silk flap ventilators into the chimnies, and perforated panes in the upper window sash.

The canteen has no serjeants' room.

The regimental stores require additional windows for light and ventilation.

*The Sanitary Improvements required for Fermoy New Barracks are as follows:—*

1. Reduction of numbers of men in the barrack-rooms to the extent stated.

2. Ventilation of all the barrack-rooms by shafts and inlets for air. Ventilation of the guard-rooms and workshops in a similar manner. Ventilation of the staircases by a shaft through the roof and perforated glass panes. Remodelled grates to be provided for all the rooms. All the serjeants' rooms to be ventilated by a silk flap ventilator into the chimney. Canteen to be ventilated by silk flap ventilators into the chimney, and by perforated glass panes. Every barrack-room and serjeants' room to be lit by a ventilated gas-burner.

3. Lavatories to be better ventilated, by perforated glass panes. A ledge to be placed on the bench of the lavatory on the east side of the barracks.

4. A bath-house, with fixed baths in the proportion of one bath to every 100 men, and with water laid on, to be provided.

5. Wash-houses to be provided with fixed tubs, drying closets, and laundry stove, and with means for ironing linen.

6. A roasting oven to be supplied to each cook-house, louvres for ventilation, and skylights to be inserted in the roofs.

7. All the privies within the barrack precincts to be converted into water latrines, with sufficient drainage, with divisions of seats and half-doors, and sufficient light and ventilation. Water supply to be improved for this purpose. All cesspits to be abolished. A water latrine is required for the guard-room. All urinals to be supplied with water. The barrack refuse should be collected and removed daily, and ash-pits abolished.

8. Day-rooms lit with gas, and suitable amusements for the men to be provided. A ball court is also required.

9. Covered drill sheds, for wet weather, to be erected.

Lastly, married quarters should be built on some convenient ground near the barracks.

*Fermoy New Barrack Hospital.*

This hospital is a recently constructed stone building, originally built by the Poor Law Guardians, when in possession of part of the New Barracks. It is situated to the south of the barracks, in an airy healthy position, detached from other buildings.

It consists of a single block, three flats high, divided up the middle by a central passage and staircase, with the wards on each side on the two upper floors. There is a projection carried out behind the line of the building, in which an opthalmic ward is situated.

There are in all seven wards, affording space, according to the existing regulations, for 66 beds.

The wards are considerably overcrowded, as will appear from the following table :—

| Wards. | Present Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Space. |
|---|---|---|---|
| 3 | 7 | 4 | 3 |
| 4 | 7 | 4 | 3 |
| 6 | 12 | 6 | 6 |
| 8 | 4 | 2 | 2 |
| 9 | 12 | 6 | 6 |
| 10 | 12 | 5 | 7 |
| 11 | 12 | 5 | 7 |
| Total - | 66 | 32 | 34 |

The deficiency of bed accommodation, at (as nearly as may be) 1,200 cubic feet per bed, is therefore above one-half of the total regulation accommodation.

The larger wards have each five windows, three on one side and two on the other, and where the third window ought to be is a recess four or five feet deep, in which is placed a bed for the orderly. This is a very objectionable arrangement. No hospital can be said to be fit for its object in which the orderlies have no separate sleeping accommodation.

In each of the large wards there are two fireplaces, one of which only is used. There are no special means of ventilation, although it is much wanted. We should propose to use one of the chimnies as a ventilating shaft. To do this, the fireplace ought to be bricked up, and an opening made into the chimney close to the ceiling. The opening should be double the sectional area of the chimney. An inlet for air, with a perforated zinc cornice, ought also to be introduced on each side of each ward.

The ophthalmic ward should be ventilated by an air shaft and inlet. All the fire-grates should be remodelled, to save heat.

This hospital, like the barrack, is at present lit by candles, instead of which a ventilated gas-burner ought to be introduced into each ward.

The kitchen, bath-room, lavatory, and latrine are placed in a lean-to building, a few feet from the back of the hospital.

The kitchen requires a better cooking range.

The water latrine, one of Macfarlane's, is of good construction for cleanliness, and for saving water, but it has no proper seating or divisions. This defect requires remedy. It is flushed into a cesspit, of which the contents, when emptied, are carried away in front of the hospital. This arrangement is most objectionable, and the whole hospital drainage requires to be improved along with that of the barrack.

The lavatory and bath-room are too far away from the wards, and the sick have to walk in the open air to reach them, as well as to go to the latrines. As a temporary measure, it would be advisable to carry an enclosed corridor from the back door of the hospital to the outbuildings, and along their front to the latrine. The hospital enclosure towards the short rifle range is open, and is a thoroughfare for the men going to rifle practice. The enclosure should be completed, and the space enclosed supplied with seats for convalescents.

We shall recur to the question of extending this hospital, and shall confine our recommendations to the smallest amount of improvement requisite for securing the health of the existing building.

*We would recommend as follows :—*

1. That the number of beds in each ward be reduced, so as to give 1,200 cubic feet per bed.

2. That each ward be ventilated by an opening into the disused chimney shaft double the section of the shaft. An inlet for air, with a perforated zinc cornice, to be made in the wall close to the ceiling, on each side of the ward. Ophthalmic ward to be ventilated by a shaft and inlet. Ward grates to be remodelled.

3. A new cooking range to be placed in the kitchen.

4. A ventilated gas-burner to be introduced into each ward.

5. A closed corridor to be erected, to connect the bath-room and latrine with the hospital.

6. Latrines to have seats and divisions provided.

7. Cesspit to be abolished, and the hospital to be thoroughly drained along with the barracks.

Lastly, a temporary sleeping place should be set apart at once for the orderlies, who ought forthwith to be removed out of the wards.

### 2. Cavalry and Old Infantry Barracks.

These barracks, as already stated, are situated at a short distance from the New barrack. They consist of two parts, one for cavalry and the other for infantry.

The infantry part forms three sides of a square with the angles closed, and the Cavalry barrack occupies a range of buildings behind the centre. The total area, within the barrack enclosure, is 13 acres 13 perches.

The buildings were erected about 1805, and some of the outhouses were built within the last ten years.

The whole establishment is by no means so good as the new barrack, and some parts of it, as for instance, the guard-room, and the officers' mess establishment, would require entire reconstruction to make them what they ought to be.

The total regulation accommodation in both cavalry and infantry barracks is for 1,380 non-commissioned officers and men.

The infantry barrack-rooms are arranged in houses, each with a central passage and staircase. There are three flats of rooms, all of which are very much overcrowded. There are six rooms in the cavalry barracks, containing 66 men, with a regulation space of no more than 195½ cubic feet per man, exhibiting the greatest amount of overcrowding we have yet met with in any barrack.

The following table shows the amount of regulation accommodation in both barracks, compared with what it would be at 600 cubic feet per man :—

| Rooms. | Total Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Cavalry : | | | |
| 12 | 132 | 60 | 72 |
| 6 | 66 | 24 | 42 |
| Total - | 198 | 84 | 114 |
| Infantry: | | | |
| 50 | 800 | 550 | 250 |
| 26 | 416 | 234 | 182 |
| 4 | 44 | 28 | 16 |
| 2 | 22 | 10 | 12 |
| Total - | 1,282 | 822 | 460 |

The room dimensions do not admit of being divided equally into spaces of 600 cubic feet each, without leaving a considerable remainder ; we have, therefore, allowed rather less than the amount in this case, because of the high airy position of the barrack, and its free external ventilation. Still the deficiency of accommodation in the cavalry barrack is nearly 60 per cent., while in the infantry barrack it amounts to nearly 36 per cent. The cavalry rooms hold each 11 men.

To effect the necessary reductions in these rooms, the numbers in the first 12 rooms in the table will have to be reduced from 11 men to six men per room. In each of the six rooms in the second set, the numbers will have to be reduced from 11 to four men per room.

The reductions in the infantry barrack-rooms will have to be as follow :—

In the 50 rooms first in the table, the numbers must be reduced from 16 to 11 men per room.

In the next 26 rooms, the number must be reduced from 16 men to nine men per room.

In the four 11-men rooms the number will have to be reduced to seven men per room.

And in two 11-men rooms to five men per room.

This barrack, when the reductions are made, will thus afford accommodation for no more than 84 cavalry and 822 infantry.

There are no serjeants' rooms, and the serjeants have bunks in the soldiers' rooms.

In the infantry barracks the soldiers' rooms go through and through the houses from front to back. Seventy-six rooms have each four windows, two on either side of the room. The remaining 13 rooms have two and three windows each. Three of these rooms have one man each, and four have two men in each.

There is only one fireplace to each room.

There are no sufficient arrangements for ventilation ; and it will be necessary to provide a ventilating shaft for each room, with inlets for air, covered with perforated zinc cornices, between the windows, as already recommended for the new barrack. The fire-grates should, at the same time, be remodelled to save heat.

In some of the barrack-rooms the lower half of the window frame is fixed. It would be an additional improvement in the means of ventilation to replace these window sashes, by the ordinary sashes with pulleys, so that both may be opened.

The staircases should all be ventilated by an air shaft carried up through the roof above, and by perforated panes in the windows.

Similar ventilating arrangements by shafts and inlets are required in the cavalry barrack. The fire-grates in this barrack ought also to be remodelled.

All the rooms are lit with candles, in lieu of which a ventilated gas-burner should be introduced into each room.

There are no day-rooms for the men. A sufficient number should be provided, as already suggested, for the new barrack.

There are two school-rooms, besides a large chapel school. There is also a good library. All of these require ventilation, the chapel school by ventilators in the ridge, and by admitting fresh air round the stoves ; the library and school-room by ventilating shafts, and perforated glass panes in the windows.

There are eight ablution houses in the rear of the soldiers' barracks. They are rather small, and they require ventilation by perforated glass panes, but otherwise they are sufficient.

There are no baths. A bath-house will have to be constructed, with baths and water laid on, in the proportion of one bath to every 100 men.

There is no proper laundry, but there are two women's wash-houses behind the soldiers' ranges, and in line with the ablution houses. They have boilers and stands, but no fixed tubs ; the floor is not properly sloped for drainage. There are no laundry or drying stoves, and the wash-houses have not sufficient light and ventilation.

A proper laundry for this barrack might be built in connexion with married soldiers' quarters, but until this be done it will be necessary to remedy the defects pointed out in the existing wash-houses.

There is no accommodation for married soldiers. Such accommodation is much required, and there is land suitable for the purpose close to the barracks. At present from four to six families have to be accommodated in a soldiers' barrack-room.

There are six cook-houses, furnished with boilers only. Each cook-house requires a roasting oven. All these cook-houses should have more light given to them, either by windows or skylights, and more ventilation through the roof and by perforated glass panes in the windows.

There are five cleaning sheds, with one bench each. A portion of the shed is used for giving out meat and bread. Being open in front, it is stated to be inconvenient in wet weather.

There are no drill sheds.

There is an armourer's shop, and two tailors' and two shoemakers' shops. These shops are small, low, narrow, lean-to buildings, with the front wall not exceeding six feet in height. They would be improved in their healthiness by ventilation through the roof, but they are not suitable for their objects. It would be much better to make other provision for pursuing trades.

The water supply is derived from three wells with engine pumps. The quantity is not sufficient for sanitary purposes, and it will have to be increased either from the wells or from the water spring already mentioned, as a source of supply for the new barrack. The roof water of the buildings ought to be saved for washing purposes.

Water tanks, at a sufficient elevation, are required for distributing the water to the latrines, urinals, wash-houses, kitchens, &c.

All the latrines are of the usual defective construction, and drain into cesspits. They were in a most offensive state, and require complete reconstruction as water latrines, with water laid on, suitable drainage, divisions of seats, half-doors, light, and ventilation.

Water-closets should be introduced for the officers' quarters, instead of the present offensive arrangements.

All the urinals require reconstruction, on a better plan, and with water and drainage.

There is a detached house used at present as staff-serjeant's quarters. It is a very unsuitable building for the purpose. The rooms require ventilation by silk flap ventilators into the chimnies. It would be desirable to provide more suitable quarters.

There are two guard-rooms at the entrance gate of the barrack. They are connected by a covered passage. They are low, dark, and badly ventilated. The ventilation might be improved by shafts and inlets in the usual way, and by remodelling the grates to warm part of the admitted air. A latrine and urinal are also required for the guard-room. But the building ought to be entirely reconstructed, and a suitable lock-up provided, instead of mingling the prisoners with the men, as at present.

The canteen is complained of as being too small for the strength. The rooms require ventilation by silk flap ventilators into the chimnies, and by perforated glass panes.

The serjeants' mess-rooms require ventilation in a similar manner.

Complaint is made that, in consequence of this barrack being occupied by a depôt battalion, the orderly rooms are insufficient. It would be almost impossible, in such cases, to set apart an orderly room for each regiment : but it is worthy of consideration whether some revised provisions as to orderly-rooms might not be made.

The cavalry stables are detached from the men's quarters. They are too dark, and require additional windows and perforated glass panes for ventilation.

*The following is a Summary of the Sanitary Improvements required for the Old Barrack :—*

1. Reduction of numbers in all the barrack-rooms, to the extent stated.

2. Ventilation of all barrack-rooms by shafts and inlets for air, as described. Fire-grates to be remodelled. Barrack-room staircases to be ventilated by shafts and perforated glass panes. Staff serjeants' quarters, serjeants' mess-rooms, and canteen-rooms, to be ventilated by silk flap ventilators in the chimnies, the two latter also by inlets for air. Library rooms to be ventilated by a silk flap ventilator in the chimney, and inlets for air. School-rooms to be ventilated by shafts and inlets for air. Guard-rooms to be ventilated by shafts, and the grates to be remodelled.

3. Barrack to be lit with gas, and a ventilated gas-burner to be introduced into every barrack-room.

4. Day-rooms, properly furnished, to be provided for the men.

5. Ablution houses to have perforated glass panes introduced into the windows.

6. A bath-house to be erected, with baths in the proportion of one bath to 100 men, and water laid on.

7. Water supply to be augmented and improved, as suggested.

8. All privies to be reconstructed as water latrines, with drainage and water supply, and divisions of seats and half-doors. Cesspits to be abolished. Officers' quarters to be provided with water-closets. Urinals to be reconstructed and supplied with water. The guard-room requires a latrine and urinal.

9. Wash-houses to be provided with fixed tubs, laundry and drying stoves, and means of getting up linen. Additional light and ventilation to be provided for these houses, and the floors to be properly drained.

10. Each cook-house to be provided with a roasting oven, and to have additional light and ventilation.

11. A covered drill shed to be provided.

12. Additional light and ventilation for the cavalry stables.

13. Barrack refuse to be collected and removed daily.

Lastly. Married quarters ought to be provided, and suitable workshops, and a good lock-up room erected.

We ought, before concluding, to notice the condition of the officers' mess establishment in this barrack. In many important points its construction is most defective, and we would strongly recommend that better accommodation should be provided.

### *Hospital, Old Barrack.*

This hospital is situated in a good airy locality, at a short distance from the old barrack. It consists of a centre and two slightly projecting wings, with the offices carried out behind, and connected with the centre of the building.

The centre part consists of a front range of rooms, partly used for offices, partly for wards, the whole being connected by a corridor and staircases, to afford a covered communication between all parts of the building. The result of this arrangement (always to be avoided in hospital construction) is, that the wards in the centre of the building have windows only on one side, and no possibility of thorough ventilation, while the only tolerably good wards are those in the wings. The corridors, especially the one on the ground floor, are dark, defectively ventilated, and the ground floor corridor is damp, and flagged in place of being boarded.

There are in all 16 wards, with regulation space for 155 beds. All the wards are much overcrowded, as will be seen from the following statement of accommodation :—

| Wards. | Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| No. 1 | 11 | 6 | 5 |
| „ 2 | 11 | 6 | 5 |
| „ 6 | 11 | 6 | 5 |
| „ 7 | 11 | 6 | 5 |
| „ 8 | 11 | 6 | 5 |
| „ 9 | 11 | 6 | 5 |
| „ 11 | 8 | 4 | 4 |
| „ 12 | 5 | 2 | 3 |
| „ 13 | 5 | 2 | 3 |
| „ 14 | 11 | 6 | 5 |
| „ 15 | 11 | 6 | 5 |
| „ 16 | 11 | 6 | 5 |
| „ 17 | 11 | 6 | 5 |
| „ 21 | 5 | 2 | 3 |
| „ 22 | 11 | 6 | 5 |
| „ 23 | 11 | 6 | 5 |
| Total - | 155 | 82 | 73 |

It will hence be necessary to remove six beds out of each of the 12 larger wards, which will give, as nearly as may be, 1,200 cubic feet for each of the remaining six beds.

Ward No. 11 has eight beds, but only two windows. The space it contains will not divide equally into portions of 1,200 cubic feet. By removing four beds out of it, the remaining four will have a little more than 1,200 cubic feet each.

Wards 12, 13, and 21, are small rooms, with a single window each, and they ought on no account to have more than two beds placed in them.

It is necessary to state, that in this hospital the most objectionable practice of making the orderlies sleep among the sick is also carried out ; and that in each of the 11-bed wards one of the beds is occupied by an orderly.

If this practice is to be continued, each of these wards will hold no more than five patients.

Accommodation for orderlies ought at once to be provided out of the wards.

It would be much better to give up a sufficient number of the smaller wards to the attendants, where they might be accommodated with 600 cubic feet of space each, than to let them sleep where they do at present.

None of the wards are ventilated, and they all require ventilating shafts and inlets for air.

The corridors should also be ventilated by perforated glass panes.

The ward grates are of a very defective construction, and waste much fuel. They ought to be remodelled, for heating part of the admitted air in winter.

The ward windows are of an imperfect construction. The lower half of the frame is fixed, and cannot be opened. The upper half is swung on pivots. It would be desirable to make the windows open by pulleys in the usual way.

The hospital is lit by candles, although a gas main passes the front of it. Gas should be introduced, and a ventilated burner supplied to every ward.

There is no proper lavatory, and no bath-room. There are two kitchens in the yard behind, and one of them is used as a lavatory and bath-room, but there is no proper bath. Besides, the patients have to reach the place, such as it is, by traversing cold damp passages. If this hospital is to be continued, it would be advisable to build a proper bath-room and lavatory for each flat.

There is no laundry.

The kitchen arrangements are sufficient ; but the

kitchen requires ventilation by perforated glass panes in the windows.

The water supply is very defective. There are two pumps, both of which are stated to be out of repair, and water has to be carried by contract in a water cart for the daily use of the hospital.

A remedy should be found for this at once. If the supply suggested above for the barracks be obtained, the hospital might be supplied at the same time.

The hospital is not drained or sewered. The whole of the sewage passes into three cesspits, too close to the wells; and when the cesspits are full, the matter is removed by contract.

In the yard behind the hospital there is an open privy and a cesspit of the usual construction, and very offensive. It is used by convalescents. It requires to be reconstructed as a water latrine, with divisions of seats and half-doors, and to be properly drained. .

There are three water-closets within the building, but they are of defective construction, and hardly ever in order. They should be replaced by proper soil-pans.

The provision store requires shelves. There is no accommodation for the sick of soldiers' families.

This hospital is by no means in good sanitary condition. It would require a large outlay to make it so; and even if this were done it would be unfit for sick, on account of the prospective opening of the Mallow and Fermoy railway, the station of which is to be opposite to the hospital, on the other side of the road.

We are of opinion that two separate hospital establishments are not required at Fermoy barracks. The hospital at the new barracks is the better establishment of the two, and as it requires extension to afford the necessary space for the sick at the new barracks, it would be very desirable to extend it sufficiently to afford the accommodation needed for both barracks.

In doing this, the error of construction exhibited in both hospitals ought to be carefully avoided, and such wards erected as will admit of free ventilation and light, while they afford sufficient cubic space for the sick.

*With regard to the Hospital at the Old Barracks, we would recommend, as absolutely necessary for its immediate Sanitary Improvement;—*

1. That the number of beds in each ward be reduced to the extent stated, and that the orderlies be removed out of the wards, and have separate sleeping rooms provided for them.

2. That all the wards be ventilated by shafts and inlets for air; that the fire-grates be remodelled; and that perforated panes be introduced into the windows of the corridor and kitchens.

3. That gas be supplied to the building, and a ventilated gas-burner introduced into every ward.

4. That the hospital be drained along with the barrack, and all cesspits filled up.

5. That water-closets of better construction be supplied, and that the privy in the hospital yard be reconstructed as a water latrine, with suitable seats, divisions, and half-doors, and suitably drained.

6. That the hospital be supplied with water sufficient for all purposes, either by improving the wells, or by bringing water from a distance, as suggested.

Lastly, unless the building is to be given up, and new hospital accommodation provided, it will be necessary to extend it to double its present size, and to provide, in addition, for the reception of the sick of soldiers' families; bath-rooms and lavatories being at the same time constructed for the entire establishment.

Sidney Herbert.
John Sutherland.
W. H. Burrell.
Douglas Galton.

To the Secretary of State for War.

*Barrack and Hospital Improvement Commission.*
*February* 10, 1859.

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# CHANNEL ISLANDS.

Sir,

We have visited and inquired into the sanitary condition of the principal barracks in the Channel Islands, and have now the honour to transmit you the following report in regard to them.

## GUERNSEY BARRACKS.

There are nine barracks of different sizes in the island of Guernsey. Several of them are very small, and rarely occupied by troops. These we did not inspect, preferring to confine our attention to the following larger establishments, which we examined in detail:—

I. Fort George, Citadel.
„ Royal Artillery.
II. Castle Cornet.
III. Fort Richmond.
IV. Fort Homette.
V. Jerbourg.

These we proceed to report on separately.

## I. FORT GEORGE.

Fort George is situated on the summit and slopes of a headland to the south-east of St. Peter's Port. The position overlooks the sea, and ought to be a very healthy one.

There are two sets of barracks in the fort, one for Royal Artillery, and another in the citadel usually occupied by infantry. These barracks differ considerably in construction and arrangement.

### 1. The Citadel Barracks.

The citadel is a square fort occupying the summit of the headland. The barracks are built in square, with the angles open, and enclose a parade ground. Three sides of the square are occupied as men's quarters. The fourth side, opposite the entrance gate, contains the officers' quarters and mess establishment, under which is a sunk basement for kitchens, &c. The blocks are separated from the curtains of the fort by a casemate extending the whole length of the block. Each block is two stories high, the top story being on the same level as the terreplein of the rampart. The top of the parapet is nearly on the same level as the ridge of the upper barrack-rooms, so that, although the position is high and airy, the men's quarters, so far as ventilation is concerned, are sunk entirely below the level of the ground. There are no inner staircases. Access to the upper floors is obtained by an outside corridor reached by outside stairs, and the room doors, both above and below, open directly on the outer air, which is an excellent arangement for ventilation if the doors be properly sheltered by porches.

There are 32 men's rooms, all nearly of the same size, namely, 17 feet long by 16 feet 6 inches wide. Fifteen rooms are each 10 feet high, and 17 rooms are 9 feet high. The regulation accommodation is eight men per room, at from 315 to 350 cubic feet per man.

As barrack accommodation, these rooms are very defective, and far from healthy in construction. They are small square cells, having each one window on the same side as the door, but no window to the back. Each window is 2 feet 7 inches wide, and they vary from 4 feet 6 inches to 5 feet 6 inches high.

The overcrowding is so great, that when the beds are made down they almost touch each other. In the following table is given the present accommoda-

tion in contrast with what the accommodation would be if 600 cubic feet per man were allowed in each room :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Number of Men per Room, for which there is Accommodation at 600 Cubic Feet in each Room. |
|---|---|---|---|---|
| 17 | 136 | 68 | 68 | 4 |
| 15 | 120 | 75 | 45 | 5 |
| 32 | 256 | 143 | 113 | - |

As none of the rooms will divide into spaces of 600 cubic feet without a remainder, we have allotted four men per room to the first 17 rooms, which gives a small excess over the 600 cubic feet. The 15 rooms will hold each five men with less than 600 cubic feet. There is no doubt, however, that the floor space is better adapted for four beds than for five.

The men's accommodation in the Fort is therefore sufficient at the outside for 143 men, instead of 256, its present regulation number.

There are four staff-serjeants' rooms, with accommodation for one man each, in the same space as that allotted to eight men in the barrack-rooms.

The rooms are imperfectly ventilated, those on the ground floor by shafts—those above by openings in the ceilings apparently communicating directly with the space under the roof, which space has openings at the end.

There are no inlets.

Each room requires shafts carried above the roof. They should have the usual section, and they should be close to the back wall. An inlet of the usual construction should be placed over the door or window close to the ceiling. Each room should have a ventilating grate for warming the admitted air in winter. With diminished numbers and improved ventilation, these rooms would become much more wholesome than they are at present.

The barracks are lighted with candles. There is a gas main about a quarter of a mile off, from which gas for the barracks could be obtained. A tender for the work was sent in above a year and a half ago, but the necessary outlay has not yet been sanctioned.

There is a good and sufficient ablution and bath room constructed out of a soldiers' room in one of the ranges. It is well lighted, and is ventilated by perforated glass panes. It has benches, gratings, and pegs, and has recently been supplied with a bath. This room is at some distance from one of the men's ranges, though sufficiently convenient for the other two.

There is no laundry accommodation, and there is certainly no space for it in the fort, unless some temporary erection could be put up in the ditch where the privies are.

The kitchens, of which there are two, are in the dark casemates behind the ground-floor range of men's rooms. Each is supplied with eight 25-gallon boilers, and one has an oven. There is ventilation by shafts. Reflectors at the doors to direct the light into the kitchens would be a great improvement.

Water is derived from a deep well in granite rock, and also from rain-water tanks. It is stated to be abundant and good, but rather hard.

The drainage is very imperfect, although there are sufficient natural facilities for it. Its utility is limited to carrying off surface and other water, for which purpose an outlet is found over the cliffs into the sea. The drains are stated to be built of brick and stone, which it would be very desirable to replace by earthenware pipes when repairs are required. All the gulley grates are stated to be trapped.

For the main purpose of drainage, however, namely, removing the sewage of the Fort there is no provision whatever. The privies are placed over cesspits, in the ditch behind one range of men's rooms, and the entire subsoil appears to be saturated with filth in consequence. At all events the whole atmosphere smells of it in and around the privies, from which the odour can be traced along the back of the men's rooms to the angle of the square, where access to the ditch is obtained by means of a gateway under the rampart. Up this gateway, at some distance from the privies, there passes a constant current of foul offensive air, which enters the square at the corner to such a degree that nobody with any ordinary sense of smell would choose to walk in the vicinity.

This state of the drainage has existed for many years, and has been long a cause of complaint. It will be necessary to clear out and abolish the cesspits, and to drain the privies to the sea, reconstructing them, at the same time, as water latrines on Macfarlane's principle, with divisions and half-doors. The buildings should be lighted and ventilated in the usual manner,

Similar improvements should be carried out in all privies and cesspits in the Fort.

Properly constructed urinals, supplied with water, and conveniently situated for the men's rooms, are also required.

Close to the privies is a large and very offensive ash-pit. It ought to be entirely abolished, and a proper ash-pit provided outside the ditch. It would be necessary to have a barrow for removing the dust and refuse to this ash-pit. It should be constructed in the usual manner, with the floor paved and drained, and raised above the level.

There is no accommodation for married soldiers, except barrack-rooms.

At the time the return was made to us the Artillery barracks were exclusively occupied by 26 families, containing 47 children.

There is no day-room. There is a small library requiring ventilation.

At a short distance from the Royal Artillery barrack is an excellent new school-room for the garrison, well lighted and ventilated, and well adapted for its purpose.

The only workshop is a soldiers' room used by tailors. It requires improved ventilation like the other barrack-rooms. There is no drill shed.

There are three guard-rooms belonging to the Fort. They all require ventilating shafts and remodelled grates. Two cells at the entrance gateway of the citadel are very bad and unfit for occupation, but new cells are authorized to be constructed. There is no lock-up.

Canteen accommodation is provided in one of the long casemates behind the range of rooms nearest the privies. The floor is below the level of the ground, and as the only light comes from a door and window at one end, opposite which there is a high wall, the place is dark and bad. The current of foul air from the ditch already mentioned rushes past the canteen door, and is the source from which ventilation is supplied. Little or nothing can be done to improve this place. Possibly reflectors would increase the light. An inlet for fresh air might be placed over the door, and an Arnott's ventilator in the chimney. The only way to obtain pure air is to drain and improve the latrines, and to abolish the ash-pit, as already mentioned. The place might be further improved by a thorough cleansing, and by repeated lime-washing.

The medical officer informed us that this barrack yielded a larger proportion of slight cases of sickness attributable to the state of the room atmosphere than the adjacent artillery barracks.

*The following is a Summary of the Sanitary Improvements required for the Citadel Barracks, Fort George:—*

1. Reduction of the number of men to the extent shewn in the table.

2. Ventilation of the barrack-rooms by shafts of the usual area, inlets over the doors, and remodelled grates. Ventilation of the tailors' shop in a similar manner. Ventilation of the guard-rooms by shafts and remodelled grates.

3. Gas to be laid on, and barrack-rooms to be lighted with gas.

4. Kitchens to have Chappuis' reflectors to increase the light.

5. All cesspits to be abolished. The privies to be drained to an outlet, supplied with water, and reconstructed as water latrines on Macfarlane's principle. To have divisions and half-doors, and the buildings to be lighted and ventilated.

6. Improved urinals, supplied with water, to be provided.

7. Ash-pit to be abolished, and reconstructed outside the fort; to be raised above the ground, and to be paved and drained.

8. Canteen to have reflectors to increase the light. Ventilation to be improved by an inlet over the door, and by an Arnott's ventilator in the chimney. Walls to be cleansed and lime-washed.

In as far as regards deficiency of accommodation of various kinds, such as day-rooms, &c., there is no room for supplying it within the citadel, and whatever is done in this matter had better be done with reference to the garrison. There is plenty of space for the purpose outside the citadel walls.

### 2. Royal Artillery Barracks.

These barracks are situated on an almost perpendicular slope, at some distance below the citadel, and between it and the sea. In order to obtain a foundation for the buildings the rock has been cut away, and a plateau formed on which the barracks have been constructed in a single line, with a long narrow parade ground in front of them overlooking the sea below. They are constructed in houses two floors in height. The lower floor is only a few feet from the scarped rock out of which the ledge has been cut, consequently these lower rooms have windows only on one side. The upper rooms are reached by a narrow road between their back wall and the rock, allowing of windows on two opposite sides, in which respect the upper rooms are much better than the lower rooms. We found the air in these upper rooms comparatively fresh, with the windows on both sides open; but the air in the lower rooms was very close and impure, even with all the windows open, a fact which shows the great advantage of through and through windows with reference to efficient ventilation, as proved by the experience of these two sets of rooms occupying the same locality. The narrow space between the back wall of the lower rooms and the rock is left open at the two ends to admit of some movement of the air behind; but the opening is covered above by flagging, except that there are a few very small iron gratings only a few inches square, let into the flagging to increase the ventilation. Considerable improvement is required to diminish the dampness of the air in this narrow recess, and to cut it off as far as possible from the lower rooms, in which a feeling of dampness can be distinctly recognized.

In the narrow space of ground intervening between the back walls of the upper rooms and the rock are placed the cook-houses, ablution houses, &c. The urinals and privies are placed at the ends of the range of lower rooms.

These barracks contain nine men's rooms and eight staff-serjeants' rooms. The men's rooms are 21 feet wide from front to back, and 10 feet 6 inches high. One room is 25 feet long; seven rooms are each 31 feet long, and one room is 35 feet long; each room has three windows, 6 feet 2 inches high by 3 feet 4 inches wide. The upper rooms are cheerful, and comparatively good. The lower rooms are by no means so good. Both floors are connected by roomy staircases. The upper floors open on the pathway behind them. The lower rooms open on the parade ground in front.

This barrack has regulation space in nine rooms for 133 men, at from 424 to 514 cubic feet per man. The following table gives the details:—

| Rooms. | Total Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. | Number of of Men per Room at 600 Cubic Feet per Man. |
|---|---|---|---|---|
| 7 | 105 | 77 | 28 | 11 |
| 1 | 15 | 13 | 2 | 11 |
| 1 | 13 | 9 | 4 | 9 |
| Total 9 | 133 | 99 | 34 | — |

The deficiency of accommodation at as near as may be 600 cubic feet per man is for 34 men.

There are no sufficient means of renewing the air in any of the rooms. Ventilation is, however, most defective in the lower rooms, partly from the want of through and through windows, and partly from the dampness of their position. Any improvement in these rooms must include a free circulation of air in the space between the back wall and the rock, and suitable precautions to prevent the ground under the floors becoming damp from percolation of moisture.

To effect these objects the earth or rock behind the wall should be lowered to 18 inches below the level of the flooring of the lower rooms, and drained to the lowest point to admit of a ready discharge of any water coming from the rock. The ventilation of the cavity should be rendered as complete as possible by inserting a sufficient number of large iron gratings about three feet in length at intervals in the flagging which covers the cavity above. These precautions would ensure light, air, and dryness in this close damp space. Each of the lower rooms should at the same time be ventilated by a shaft carried above the roof at the back wall, and by two inlets for fresh air placed close to the ceiling through the front wall.

Each upper room should have a shaft carried through the ridge above the roof, and two inlets for fresh air, one on each of the opposite sides of the room.

As all the rooms are warmed by the old pattern grate, it will be necessary to remove these, and provide ventilating fire-grates instead.

These barracks, like those in the citadel, are lighted with candles instead of gas, which is equally available for both establishments.

There is no day-room.

Ablution accommodation is provided in a temporary shed building erected against the cook-house. There are slate benches, basins, and water supply, but the accommodation is bad, and should be entirely reconstructed, together with means of bathing, which have not yet been provided.

There are no proper means of washing and getting up soldiers' linen, except a very defective wash-house, with boilers, in the same line as the cook-house; it requires reconstruction, with the usual arrangements; fixed tubs, grating, water laid on, boilers, and means of drying and ironing. One such establishment would be sufficient for the fort.

The cook-house has boilers and an oven. The latter is not constructed on economical principles. It consumes too much coal and requires too long a time to cook.

The apparatus should be replaced by a better when it is worn out.

The barrack has no shelter for the men in wet weather except the barrack-rooms, and there are no workshops.

Water is obtained from wells and rain-water tanks in connection with the citadel supply, It is stated to be good and sufficient.

The natural facilities for drainage are most ample, but their use is confined to the removal of surface and refuse water which is discharged over the cliff. The surface drainage behind the barracks is very defective, and opposite one of the doors leading into the men's rooms are two large open gulley grates, quite unnecessary, and very hazardous in such a position. One should be closed, and the other should be removed to the lowest end of the pathway. Two such grates are quite unnecessary.

The latrines of these barracks are at a lower level than the barrack-rooms. They are of the usual defective construction, and are not supplied with water. They were in a very offensive and unwholesome state, and the buildings have neither sufficient light nor ventilation.

These privies should be reconstructed as water latrines on Macfarlane's principle, with drainage and water supply. They should have proper divisions and half-doors, and the buildings should be lighted and ventilated through the roof.

Improvements in the urinals are also required. Those at present in use are both defective and offensive.

Slate or iron urinals, properly drained, and supplied with water for cleansing, should be introduced instead of the present arrangements.

There are eight staff-serjeants' rooms in these barracks, but no accommodation for married soldiers.

Each of these rooms should have an Arnott's ventilator in the chimney, and an improved grate.

There are two guard-rooms, with lock-up rooms, belonging to these barracks, besides the pier guard-room. They all require ventilation by shafts and improved grates. The lock-up at the barracks is hardly fit for occupation.

These barracks are provided with a ball court under the cliff.

The open airy position of the barrack buildings has kept them in a more healthy state than is due to their construction, but they should nevertheless be improved in the points we have mentioned.

*We would recommend:—*

1. That the number of beds per room be reduced to the extent shown in the table.

2. That the enclosed space between the back wall of the lower floor of rooms and the rock be lowered, drained, ventilated, and lighted in the manner described above.

3. That the lower rooms be ventilated by shafts carried up the back wall above the roof, and by two inlets close to the ceiling through the front wall. That the upper rooms be ventilated by shafts through the ridge, and by two inlets, one on each side of the room. Each room to have a ventilated fire-grate. Non-commissioned officers' rooms to have Arnott's ventilators in the chimnies, and improved grates. Guard-rooms and lock-up rooms to have shafts for ventilation. Guard-rooms to have ventilating fire-grates.

4. Gas to be introduced and laid on over the barracks.

5. Proper ablution and bath accommodation to be provided.

6. A suitable wash-house, with fixed tubs, water, boilers, ironing table, and means of drying linen, to be provided in common for both barracks in Fort George.

7. Surface drainage behind the upper barrack-rooms to be improved in the manner pointed out.

Privies to be reconstructed as water latrines, with water supply, drainage, divisions, half-doors, light, and ventilation. All cesspits to be abolished.

Improved urinals, supplied with water and drainage, to be provided.

*Hospital, Fort George.*

There is one hospital for both barracks, sometimes occupied by artillery, at other times by infantry; occasionally by both. It is situated on a narrow plateau of ground, on a slope facing the S.E., at a lower level than the citadel, and at a higher level than the artillery barracks. In order to find space for the building, the ground behind has been cut away and sloped down to the level of the ground floor, so that there is only a narrow footpath along the back wall of the hospital. The sloping ground rises above the level of the first floor, and its surface being covered with a whitish cement, much annoyance is experienced in hot summer weather from the heat reflected from its surface into the wards.

The building consists of two floors, with an attic over them. In front of it is a narrow strip of ground, with a covered ambulatory, partly for convalescents exercising, partly for communication with the hospital latrines, which are in one corner of the area.

The general arrangement of the building is sufficiently remarkable to merit notice.

On the ground floor is the dead-house, under a sick ward, with only the ceiling and ward floor intervening. Next door to the dead-house is the kitchen, also under a sick ward. There being no room for a roasting oven in the kitchen, this indispensable adjunct is placed in the wash-house, which is also under a ward, but at the opposite end of the building. A proper cooking range instead of the present kitchen grate would have rendered the erection of such an oven unnecessary. The bath and ablution room are entered from the hospital store-room, the result of which is that the clothing is exposed to damp, and part of it might be removed at any time without the knowledge of the serjeant. There is no pack store, and the packs have to be kept in the dead-house, which, however, is so damp that a fire is constantly required in it to keep the packs dry. The wine store is a closet on the second floor, so placed as to close up the passage window. By so doing it obstructs the ventilation, and occasions disagreeable smells over the whole of that floor. There is no surgery; and a small ward on the ground floor has to be misappropriated to supply the want.

In addition to all these fundamental defects in construction and arrangement, the hospital accommodation is of a very inferior character. It is intended for 60 patients, in eight wards. One of these is on the ground floor, and is used as the surgery. There are four wards on the floor above, and there are three attics which have been used for sick, although they are hardly sufficiently good to keep stores in. The ground floor ward is 33 feet 2 inches long, 18 feet wide, and 9 feet high. The four wards on the floor above are each about the same length. Two of them are 18 feet broad, and two are 12 feet 7 inches broad. All of them are 10 feet high.

The outer walls of the attic wards are 4 feet high, and the middle wall is 9 feet 6 inches high; the roof sloping from the one wall to the other. The space per bed varies from 526 to 653 cubic feet. The details for each ward are as follow:—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| Ground Floor: | | | |
| No. 1 | Surgery. | | |
| Upper Floor: | | | |
| No. 2 | 8 | 3 | 5 |
| „ 3 | 11 | 5 | 6 |
| „ 4 | 11 | 5 | 6 |
| „ 5 | 8 | 3 | 5 |
| Attic Floor: | | | |
| No. 1 | 4 | Unfit for occupation. | 4 |
| „ 2 | 14 | Do. | 14 |
| „ 3 | 4 | Do. | 4 |
| Total 8 | 60 | 16 | 44 |

In its present state this hospital ought certainly not to accommodate more than 16 beds; but as there is no accommodation for orderlies, the ward No. 2, upper floor, is used for the purpose, so that the actual bed space fit for sick is limited to 13 beds, instead of 60.

An attempt has been made to ventilate the wards by shafts, but the plan adopted is useless, and requires to be recast.

As already stated there is an ablution-room, with a bath, entered from the clothing store. The bath is of stone and not very suitable for its purpose. There is no water supply. Roof water is collected for washing purposes, and water for drinking has to be brought in a water cart.

The drainage is very defective, although there are ample facilities for it. There are no water-closets in the hospital. The latrine accommodation is situated in a damp arch, the floor of which is below the level of the ground. The place can be reached from the hospital under cover. After heavy rains the surface water sometimes covers the floor of the latrines. They are drained over the cliff into the sea.

Taken as a whole this hospital is one of the least adapted for sick of any we have seen.

It has been complained of before by medical officers, but nothing has been done to improve it. Indeed the first point to be decided is whether it is worth improving, or whether it would not be more economical on the whole to built a new hospital for the station, for at the present time there is certainly no hospital accommodation worthy of the name in Guernsey.

The present building might be adapted and enlarged for married quarters, which are much required. At the cost of a new hospital for 80 beds, which is the number required for the station, *plus* the outlay for adapting the present building for married quarters, two useful buildings would be obtained. If it were considered more advisable to extend the barrack accommodation, the present hospital, if improved, would answer equally well for such a purpose. If it is to be retained as a hospital, it will be indispensably necessary to render the building as little objectionable as possible for this purpose; and in doing so the following principles should be kept in view.

1. To remove out of the building the dead-house, kitchen, and wash-house, and to erect proper buildings for them, detached from the hospital.
2. To reconstruct the interior by raising the roof so as to obtain an additional floor of wards.
3. To re-arrange the partitions so that all the wards may have windows on opposite sides.
4. To relay the flooring, which is decayed and broken in several places.
5. To ventilate all the wards by shafts, inlets, and remodelled grates, of the usual construction.
6. To provide a water-closet, bath, and ablution-room for each floor.
7. The drainage to be revised and improved, and the ground behind the hospital lowered 18 inches below the floors.
8. Water to be laid on.
9. The hospital to be lighted by ventilated gas-burners.
10. Surgery and stores to be properly arranged and fitted up, and proper accommodation for non-commissioned officers and orderlies to be provided.
11. An exercising ground for convalescents to be provided.
12. The fire engine shed which is at present within the hospital yard to be removed.

If these improvements were carried out, accommodation for about 50 beds might possibly be obtained. But the actual number required for the station is 80.

## II. CASTLE CORNET.

Castle Cornet is situated on a high rock in the sea at the entrance to Peter's Port. Its position is airy and healthy. The buildings are of various periods, but all of them bear the marks of age, and some are in a very dilapidated and ruinous state. The barrack buildings are situated on lower levels than the upper works of the fort, on ground which appears to have been excavated out of the rock to find space on which to erect them. They are in two blocks, one for infantry, containing 24 rooms, eight of which are attics; and one block of artillery barracks containing two rooms.

There is regulation space in the 26 rooms for 188 men, having from 333 to 412 cubic feet per man. The following table gives the accommodation in each group of rooms:—

| Rooms. | Total present Regulation Accommodation in Men. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men per Room. | Proposed Number of Men per Room. |
|---|---|---|---|---|---|
| 16 | 128 | 72 | 56 | 8 { | Front 5<br>Back 4 |
| 8 | 32 | 16 | 16 | 4 | 2 |
| 2 | 28 | 20 | 8 | 14 | 10 |
| Total 26 | 188 | 108 | 80 | — | — |

In the infantry barracks the rooms are back to back, and from the cutting away of the rock to find space for the buildings, some of the back rooms are dark and not wholesome. In consequence of this we have allotted the accommodation in the above table rather in conformity with the structure and position of these rooms than with the cubic space. Thus in the group of 16 rooms, all the front rooms might hold five men each, at somewhat less than 600 cubic feet per man, on account of their facing the sea and the open air, with as little risk to health as would be experienced by four men in the back rooms where the cubic space would be above 600 feet, and we have divided the accommodation accordingly.

In the eight four-men rooms no more than two men should be allowed per room. The position and construction of these rooms would not admit of more with safety.

The 24 rooms in the first and second groups in the table are each 19 feet 3 inches long. Sixteen rooms are 15 feet wide, 9 feet 3 inches high, and have two windows each. Eight rooms are 12 feet wide, and only 7 feet high, with one window each.

The large 14-men rooms are each 32 feet 6 inches long, 17 feet 4 inches wide, and 10 feet 3 inches high. These rooms have each three windows, and are better than the other rooms.

None of the rooms are ventilated. They all require shafts, inlets, and remodelled grates. The staircases in the infantry barracks should be ventilated by shafts through the roof, and perforated glass panes in the windows.

The rooms are lighted by candles. Gas could be obtained from the town gas-works by a pipe carried along the new quay, and from the end of the quay to the fort.

There is no day-room, school-room, or library. Neither are there drill shed, workshops, nor indeed any means of recreation.

There is neither ablution-room nor bath-room.

Each barrack has a kitchen fitted up with boilers, but there are no other means of cooking. The artillery kitchen is very dark, and has no ventilation except by the door. Glass louvres in the windows would improve it.

The privies are close to the sea, and are drained, but very offensive. The barrack was unoccupied when we were there, but the smell from the privies nevertheless pervaded the whole vicinity. They require reconstruction on Macfarlane's principle.

The urinals also require reconstruction. Water is obtained from two wells, and stored in five tanks. The supply is stated to be good and sufficient.

There is a women's wash-house in the old part of

the castle. It has boilers and forms, but nothing else. It should be properly fitted up.

Part of an old building is used as a canteen. It is ruinous and filthy, quite unfit for such a purpose. The place is all but untenantable.

The guard-room requires ventilation and a remodelled grate.

From what has been stated it will be seen that there are a number of important deficiencies in the barrack accommodation of Castle Cornet, besides defects in the buildings requiring remedy. It does not appear to be often occupied, but this can afford no reason for not carrying out the improvements actually necessary for health. *We would recommend therefore*—

1. That the number of men per room be reduced to those shown in the table given above.
2. That all the barrack-rooms be ventilated by shafts, inlets, and remodelled grates. The barrack staircases to be ventilated by shafts through the roof and perforated glass panes. Guard-room to be ventilated by a shaft and remodelled grate.
3. Ablution and bath room to be provided.
4. Women's wash-house to have fixed tubs, and means of drying and getting up linen.
5. Ovens to be provided for the kitchens. Artillery kitchen to be ventilated.
6. Privies to be reconstructed as water latrines, with divisions, half-doors, light, and ventilation. Urinals to be reconstructed.
7. Better canteen accommodation to be provided.

*Castle Cornet Hospital.*

This is only a detached building of two flats, with bedsteads. It has no other feature of a hospital; not even ceilings. If it is to be used for sick, the interior should be entirely reconstructed, and proper hospital conveniences provided, of which, at present, there are none.

## III. FORT RICHMOND.

This fort is a defence work, situated close to the sea shore, about six miles from Peter Port. It has only been recently completed and, as a whole, it is a favourable specimen of fort barrack construction. The barrack buildings are two stories high, and are erected on three sides of a small square, the fourth side of which is completed by a high rampart. The situation is exposed, and there is no risk of stagnation of air.

There is accommodation in the barrack-rooms for 41 men.

The rooms are sufficiently ventilated by shafts, but it would be an improvement to substitute Sherringham's ventilators for the present covers of the inlets, with the view of throwing the air towards the ceiling. The amount of space per man is, perhaps, smaller than would be desirable in a permanent barrack, but on the other hand, the number of men is very small, and the works are merely of a defensive character, and are very unlikely to be occupied, except when absolutely necessary, and at such a time regulations as to numbers would hardly be attended to.

There are one or two points, however, in which material improvements might be easily introduced, and we shall confine our recommendations to them.

1. The kitchen is only provided with boilers, and requires a small oven for roasting.
2. The privies are of defective construction, and should be converted into water latrines on Macfarlane's principle. They should have divisions and half-doors, and the lighting and ventilation of the building should be improved.
3. A few pegs should be put up in the ablution-room.
4. Sherringham's ventilators should be used as inlets, and remodelled fire-grates introduced.

With these simple additions the barrack accommodation will sufficiently fulfil its purpose.

## IV. FORT HOMETTE.

Fort Homette is another defence work at a short distance from Fort Richmond, and about five miles from Peter Port. It is intended for the accommodation of 66 men, in four excellent barrack-rooms. The buildings are on the sea-shore, and the position is healthy. The barracks are of recent construction, and are sufficiently ventilated.

As in the preceding case, we would simply propose as follows :—

1. That an oven be supplied for the kitchen.
2. That the privies be reconstructed as water latrines.
3. That pegs be put up in the ablution house.
4. That Sherringham's ventilators be used for the inlets; remodelled fire-grates to be introduced.

## V. JERBOURG BARRACKS.

This barrack is placed on a lofty eminence overlooking the sea, in a healthy position and neighbourhood. It consists of two ranges of one-story buildings, having a parade ground between them. The surface slopes downwards from the entrance gates, and at the lower end there is a row of cottage buildings containing the barrack-serjeant's quarters, the cook-house, &c.

There are four men's rooms in two barrack houses. The two rooms in each house open out of a passage between them. The rooms are all of the same dimensions, namely 28 feet long, 19 feet broad, and 13 feet 8 inches high. They are only partially ceiled, and the height, therefore, is partly taken out of the roof. The total accommodation is for 56 men and one staff serjeant. The space in the men's rooms amounts to 519 cubic feet per man.

The details are as follows :—

| Rooms. | Total Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 4 | 56 | 48 | 8 |

Each room will accommodate 12 men at as near as may be 600 cubic feet per man, and the barracks will hold 48 men.

Provision for ventilation has been recently made by carrying shafts through the roof. This improvement should be completed by inlets back and front at the eaves, and by ventilating fire-grates.

Candles are used for lighting. Gas cannot be obtained.

There are no lavatories nor bath, and no proper wash-house.

The cook-house has two boilers, but no oven.

Water is derived from a well.

Surface drainage and rain water are conveyed by brick drains to the privy cesspit.

The privies are of the usual barrack construction, and require to be fitted up as water latrines, and drained.

There are none of the usual means of occupying the soldier, such as school-room, library, day-room, or workshop.

The barrack is only a small defence barrack, and appears to be little occupied.

We shall, therefore, confine our recommendations to those points bearing most directly on health.

1. Each barrack-room to be provided with two inlets for air under the eaves, one on each side.
2. Ventilating fire-grates to be provided.
3. An oven for the kitchen,
4. Ablution accommodation to be provided.
5. Guard-room to have a shaft and remodelled grate.
6. Privy to be converted into a water latrine, to be supplied with water, and drained.

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## JERSEY BARRACKS.

There are seven barracks and three hospitals in the island of Jersey, with accommodation for 1,182

men and 86 sick. They are placed at considerable distances from each other along the coast, and generally in healthy positions.

## I. FORT REGENT.

Fort Regent covers the summit of a granite headland, bounding the Bay of St. Helier to the south-east; it overlooks the sea. It has ample facilities for drainage, and ought, so far as situation is concerned, to be very healthy.

The fort is a long polygon, with bomb-proof casemates behind the curtains and in the flanks, under the terreplein.

There is a large parade ground enclosed by the casemates, and as the foundations of the walls cut off the natural drainage it is clear that unless the area be very well drained artificially, the rainfall will be retained for a longer or shorter period, and the ground will continue wet or sloppy after it should be dry. This is partly the case at present, for water lies on parts of the surface after heavy rains instead of being drained away immediately as it ought to be.

The casemates are circular headed; they have two windows, a semicircular fanlight, and the door, at the end facing the parade ground, and there are loop-holes at the opposite end.

Twenty-nine casemates are occupied as men's quarters; six are small apartments, 19 feet 9 inches long, 12 feet wide, 6 feet high to the top of the side walls, and 9 feet to the top of the arch. Fourteen are 42 feet long, 16 feet wide, 7 feet 10 inches to the top of the wall, and 11 feet 8 inches to the top of the arch. The remainder are 47 feet long, and 16 feet wide. They vary in height of side walls from 7 feet to 8½ feet, and from 11½ feet to 12½ feet to the top of the arch.

The total regulation number of men they are intended to contain is 510, with from 322 to 356 cubic feet per man. The following table shows the accommodation compared with what it would be at 600 cubic feet per man.

| Casemates. | Total present Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. | Present Number of Men in each Casemate. | Number of Men at 600 Cubic Feet in each Casemate. |
|---|---|---|---|---|---|
| Nos. 1, 2, 3, 4 | 88 | 48 | 40 | 22 | 12 |
| „ 29, 30, 31 | 66 | 39 | 27 | 22 | 13 |
| „ 52, 53, | 40 | 26 | 14 | 20 | 13 |
| „ 61 to 74 inclusive | 280 | 168 | 112 | 20 | 12 |
| „ 100 to 105, inclusive | 36 | 18 | 18 | 6 | 3 |
| Total 29 | 510 | 299 | 211 | — | — |

The present men's casemates would accommodate, say 300 men, at 600 cubic feet each, which is more than the number usually in barracks; but notwithstanding this the casemates actually occupied have the present regulation number of men in them. It would be easy to give the required space by simply spreading the men.

Each casemate has a shaft for ventilation through the crown of the arch; but there are no permanent inlets for air. It would be a great advantage to introduce two inlets, one at each end, close to the crown of the arch. Two Sherringham's ventilators would answer well for the purpose. These, with the shaft, would keep the internal air sufficiently pure.

Warming is provided for by the common fire-grate in the division wall, at the end furthest from the door. It might be replaced by a ventilating fire-grate with much advantage.

All the barrack-rooms are lighted with gas.

There is no day-room.

Two casemates are given up for a school-room and library. The librarian's quarter is a bunk at the end of the casemate furthest from the door; it is lighted by loopholes. There is an infant school, also in a casemate.

There is one ablution-room in a casemate, fitted up with four rows of benches and basins, having water laid on, pegs, and gratings to stand on. At the far end of it two small bath-rooms, with a painted iron bath in each, have been recently provided.

The ablution and bathing accommodation is at some distance from part of the men's quarters, and most of the men have to cross the parade ground to reach it. In other respects the accommodation appears to be sufficient.

There is a women's wash-house in a dark casemate. It requires the usual improvements.

There are two cook-houses, fitted up in casemates adjoining each other. A large stone baker's oven has been recently fitted up in one of them.

One of the cook-houses is dark and not good; the women's privy and a urinal adjoin it. This cook-house requires ventilation; the other is lighter and better; both would be improved, and a better circulation of air in them effected, if they were made to communicate with each other by a door through the intervening wall.

Water is supplied from a deep well in a large vaulted space under the parade ground. It is raised by pumps worked by a capstan. The supply is occasionally short in summer, and at such times water has to be carried at considerable expense for the use of the garrison.

The privies are among the worst and most offensive we have anywhere met with. They are drained, and the water from the ablution-rooms is conducted into them to flush them; but the smell from the privies nevertheless extends many yards along the parade ground. They require entire reconstruction as water latrines on Macfarlane's principle: indeed all the privies within the fort require this improvement.

The surface drainage ought to be at the same time improved. We found water lying in the gutters in front of the men's rooms on account of defects in levels and in the form of these gutters. The parade ground should be more effectually underdrained to remove the defect already noticed.

This fort is deficient in some important points of accommodation.

There is no day-room, cleaning-room, nor covered space for drilling in wet weather. One 20-men casemate is taken from the construction as a tailor's and shoemaker's shop, thereby diminishing the men's accommodation. There is no accommodation for non-commissioned officers or for married soldiers.

The barrackmaster states in his return that "the "married people have to be apportioned off, one to "each casemate, or what is perhaps still worse, "huddled together in two or three casemates," under circumstances where attention to decency is impracticable.

This state of matters has been previously represented, and there cannot be a doubt that the provision of proper married quarters is a matter of urgency at this station.

There is no separate mess-room and kitchen for non-commissioned officers, and two casemates have been taken from the barrack accommodation for this purpose.

The guard-rooms, cells, and lock-up are far from being sufficiently good for their purpose. The provost prisoners are together in one casemate without separation, and there is no serjeants' quarter. There are two cold, dark, and damp cells adjoining the officers' mess kitchen, quite unfit for occupation.

All require better ventilation and more light. Indeed the whole guard-room and prison accommodation of the fort requires much improvement.

The canteen occupies two casemates; it is small

but good. The ventilation should be improved on the same principle as that of the barrack-rooms.

Fort Regent, although exhibiting the defects and deficiencies we have pointed out, affords a good specimen of casemated barracks, and with a few improvements and additions would be as healthy as this class of accommodation is capable of being made.

As much can hardly be said of the casemates in the south outworks. There are in these works six small square casemates constructed for seven men each, five only of which are in any way fit for occupation.

They should be improved on the same principles as the other casemates, and not less than 600 cubic feet per man should be allotted in them.

*In regard to Fort Regent, we would recommend :—*

1. Six hundred cubic feet per man to be given in all casemates occupied as barrack-rooms.
2. Ventilation of the casemates to be improved by inlets at both ends. Ventilation of school-rooms and library to be similarly improved.
3. Women's wash-house to have fixed tubs and means of drying linen.
4. Ventilation of cook-houses to be improved.
5. Water supply to be increased.
6. Privies to be reconstructed as water latrines, with water supply and drainage, divisions of seats, and half-doors. Urinals to be reconstructed and supplied with water.
7. Under-drainage of parade ground to be improved, and levels of gutters to be rectified.
8. The whole guard-room and prison arrangements to be revised, the defective cells abolished, and suitable provision for ventilation to be made.
9. Canteen to be better ventilated.

Lastly, married quarters to be provided.

*Hospital, Fort Regent.*

This hospital is not in the fort, but on the road-side leading up to it from St. Helier. It is a one-story shed building, standing on a long narrow slip of ground, obtained apparently by cutting away the cliff behind. In front of the hospital is a tidal harbour, giving off offensive effluvia at low water in warm weather

The hospital ground is enclosed by a high wall, and by the cliff which rises immediately behind ; it has, consequently, not sufficient external ventilation.

Whether as regards structure or position, the place is fit for nothing more than the merely temporary accommodation of a few sick before removing them to better quarters. Considered as a place for the treatment of either sick or wounded men, there can be only one opinion about it, namely, that it is unfit for its object. As, however, there is at present no other available space for sick, it is necessary that we should improve the building as far as it may be practicable to do so.

The accommodation consists of four wards, in line. The two larger wards are each 30 feet long, 20 feet wide, and 10 feet high. One of the smaller wards is 14 feet square and 9 feet high ; and the fourth ward has the most singular ward proportions we have anywhere met with. It is 25 feet long, 8 feet high, and only 8 feet wide. The regulation number of beds is 26, with an amount of space varying between 533 and 600 cubic feet per man.

The following table gives the details :—

| Wards. | Present Regulation Number of Beds. | Number of Beds at 1,200 Cubic Feet each. | Deficiency in Bed Spaces. |
|---|---|---|---|
| 1 | 10 | 5 | 5 |
| 2 | 10 | 5 | 5 |
| 3 | 3 | 1 | 2 |
| 4 | 3 | 1 | 2 |
| Total - | 26 | 12 | 14 |

Even were the building otherwise suited for sick, there would be space in it for only 12 beds.

The means of lighting are singularly deficient. In one of the larger wards the windows, four in number, are only 3 feet 9 inches high. In the other large ward there are three windows, each 3 feet high.

No. 4 ward has no separate door, and it has to be reached by passing through No. 3 ward.

The wards are ventilated into the roof, and by openings near the level of the floor. These latter openings should be closed up, and proper inlets made on opposite sides of the wards close to the ceilings.

Warming is done by a common fire-grate.

Lighting at night is done with gas. There is no suitable bath or ablution accommodation ; the existing provision is quite unsuitable for a hospital.

There is no water supply, except from rain-water tanks.

There is no sewerage and no water-closet, only a privy over a cesspit, close to the front of the hospital, and next to the dead-house. Both are entered from the same passage.

The surface-drainage is defective, and there are no means of removing the rain-fall behind the hospital, or the water which percolates from the rock above.

There is a large ash-pit in front of the hospital.

The kitchen requires ventilation. There is a kitchen range ; and two boilers for cooking in the back kitchen, which is also the wash-house.

There is neither pack store nor provision store.

We are certainly not prepared to advise any considerable expenditure on this building, more especially as the necessity for a new hospital is fully admitted. There is a good and available site for one close at hand, and the sooner a proper hospital for the station is constructed the better.

*We should simply propose :—*

1. To improve the ventilation by inlets near the ceiling, and by closing up those at the floor.
2. To ventilate the kitchen.
3. To remove the ash-pit, and to make provisions for the daily removal of the hospital refuse.
4. To convert the privy into a water latrine.

Lastly, to provide temporary accommodation sufficient to allow, as near as may be, 1,200 cubic feet per bed.

It might be worth while to consider whether the required space might not be obtained out of the present officers' quarters which adjoin the hospital, by adapting them for the purpose, and providing quarters elsewhere.

## II.—ELIZABETH CASTLE.

Elizabeth Castle is an irregular pile of buildings, of various dates, situated on a rocky island in the bay of St. Helier's, about a mile from the shore, with which it is connected at low water by a long bank of sand and shingle, covered at high tide. So far as local position is concerned, there is nothing to prevent the place from being healthy.

The older part of the castle is situated on the summit of the rock, and is reached by a narrow winding stair. It contains several rooms, five of which are on the construction as men's rooms ; there are also non-commissioned officers' quarters, and a school-room.

The new or lower barracks are situated on a level plot of ground lower down, and are of more recent construction than the castle.

They are built to form two sides of a square. The men's rooms are together in one block, forming one side. In another parallel block are the mess establishment and officers' quarters. The parade ground is between the blocks. On a third side is the canteen, &c.; and the upper end of the square is bounded by the castle rock and buildings.

The lower barrack-rooms are in three houses of three stories, with through and through passages and staircases ; each house contains 12 rooms, including the attics. The rooms are back to back, four on each

story. Each room has two windows, and openings through the partition wall between the rooms. There are also louvres over the doors. Twenty-four of the rooms are each 20 feet long and 16 feet wide. Twelve of them are 10 feet 2 inches high, and 12 are 9 feet 2 inches high.

The remaining 12 attic rooms are 18 feet 6 inches long, 13 feet 6 inches wide, and have a mean height of between 6 and 7 feet only. These attic rooms are chiefly occupied as married quarters, although on the construction as men's rooms.

The old rooms in the keep are irregular in shape and dimensions. They vary from 15 to 28 feet in length, and from 11 to 19 feet in width. They also vary in height from 7 feet 6 inches to 9 feet 4 inches. They have from three to six windows per room. There are altogether 41 barrack-rooms, with regulation accommodation for 274 men. The cubic space per man varies between 419 and 464 cubic feet in the lower barrack. It is considerably less in the keep.

The following table gives the details for the whole barrack:—

| Number of Rooms. | Total Regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| Keep: | | | |
| 1 - - | 16 | 8 | 8 |
| 1 - - | 17 | 11 | 6 |
| 1 - - | 13 | 7 | 6 |
| 1 - - | 8 | 6 | 2 |
| 1 - - | 4 | 2 | 2 |
| Lower Barrack: | | | |
| 12 7-men rooms | 84 | 60 | 24 |
| 12 „ „ | 84 | 60 | 24 |
| 12 4-men rooms | 48 | 24 | 24 |
| Total 41 | 274 | 178 | 96 |

The lower barrack, which is in reality the one occupied by men, has space for only 144 men instead of 216, the present number on the construction. The actual deficiency of accommodation is therefore for 72 men.

None of the barrack-rooms have any special means of ventilation.

The rooms are warmed by the old pattern grate.

Each room requires a shaft and inlet, and also a remodelled grate for warming part of the air admitted to the room. The staircases require louvres through the ceiling and roof, and perforated panes in the windows.

The barrack-rooms are lighted with candles. Gas is not available.

There is a good ablution-room, with slate benches, and basins; water is drawn by a pump from rain-water tanks outside. A tank above ground to supply the basins is required, as are also gratings and pegs. There is no bath. It would be very advisable to provide one, if sufficient fresh water can be obtained.

There is an excellent modern cook-house, supplied with boilers and brick oven accommodation. The latter is said to be much prized by the men.

The wash-house is also a good building, but requires fixed tubs and a drying stove.

Water is obtained from the rainfall on the roofs. It is stored in underground tanks, whence it is raised by pumping. It is doubtful whether the supply can be materially increased.

All surface drainage finds a ready exit to the sea. The surface paving and guttering are, however, not very good, and should be improved. Waste water from the ablution and wash-house is conducted to the privies through which it is discharged to cleanse them.

The process is very incompletely performed, and the privies, although over the sea, are bad and offensive. They should be reconstructed as water latrines on Macfarlane's principle, and so arranged that the waste water from the ablution-rooms, &c., might be used for filling the trough of the latrine, and flushing its contents into the sea. There is no privy or water-closet attached to the infantry officers' quarters, who have to go to one 200 yards away, in all weathers, day and night. This deficiency requires remedy.

There is no day-room, and no school-room, except a misappropriated barrack-room in the keep of the castle. A good library has been recently built, and affords every needful accommodation of this kind. Both library and school-room require ventilation.

The canteen rooms are good, but require ventilation by Arnott's valves and perforated glass panes.

In one of the attics a four-men room has been set apart as a tailor's shop; but there is no other accommodation for trades.

There are two small guard-rooms, one of which at the gate is very inferior. Both require ventilation. That at the gate is a casemate with a window in, but close to the crown of the arch. This window should be used as an inlet, and an Arnott's valve should be placed in the chimney close to the ceiling. The cell belonging to this guard-room is dark and bad. Nothing short of building another will render the cell accommodation what it should be.

The barrack accommodation at Elizabeth Castle cannot be said to be good as a whole; still it might be improved by carrying out the following recommendations:—

1. Six hundred cubic feet per man to be given in the men's rooms.
2. Barrack-rooms, library, and school-room to be ventilated and warmed by shafts, inlets, and remodelled grates. Guard-rooms to be ventilated, and to have remodelled grates. Canteen tap-rooms to have an Arnott's ventilator, and perforated panes in the upper sashes of window. Staircases of barrack houses to have ventilating shafts through the ceiling and roof, and perforated glass panes in the windows.
3. Ablution-room to be supplied with water, gratings, and pegs. A bath to be provided.
4. Wash-house to be fitted up with fixed tubs, drying stove, gratings, &c.
5. Surface drainage, guttering, and paving to be improved.
6. Privies to be reconstructed as water latrines on Macfarlane's principle. To have divisions, half-doors, light, and ventilation. Improved urinals to be provided. Water-closet accommodation to be provided for infantry officers' quarters.

### *Elizabeth Castle Hospital.*

This is a small stone house, situated near the entrance gate of the Castle, at a short distance from the barracks. It overlooks the sea, and the position is airy and healthy, except that there are old buildings, apparently used as stables, close to the hospital.

The hospital is in two floors. On the ground floor to the right of the entrance is the kitchen, beyond which, and reached by passing through the kitchen, is the serjeant's room. To the left of the entrance is the stair leading to the upper flat, and opposite the entrance is the door of a ward. Upstairs there is the surgery and one other room, together with a ward over the ward below.

The ward accommodation is very inferior. The floor of the lower ward is below the level of the ground, and the ward is damp in consequence. There are four windows on one side and at one end, but the wards were close even with some of the windows open. There are no sufficient means of ventilation. There was considerable overcrowding of sick, and the amount of space per bed was less than half what it should have been in such wards. Indeed the lower ward in its present state is hardly fit for sick.

There is neither ablution-room nor bath-room, the bath stands in the open air in the yard. There is no water-closet; only an open privy in a roughly paved yard at one end of the hospital. This privy is connected with a large open cesspit close to the end of

the hospital. A urinal adjoins the privy, and both adjoin the dead-house.

This hospital, although it will never be a good one, may be much improved by the following measures:—

1. The wards should be lengthened sufficiently to afford 1,200 cubic feet per bed for the proportion of sick accommodation required by the garrison, and the earth should be cut away to 18 inches below the level of the lower ward floor.

2. The wards should be ventilated by shafts, inlets, and remodelled grates. The staircase should also be ventilated by a shaft through the ceiling and roof, and by perforated window panes.

3. A projection should be built to contain a water-closet, bath, and ablution-room, with hot and cold water laid on to the bath and ablution basins.

4. The hospital should be drained, the cesspit abolished, and a small water latrine substituted for the privy.

Lastly, it would improve the hospital to clear away old walls or useless buildings, and to keep the surface about it in a better state than it is at present.

These improvements will put the buildings in as good and healthy a state as their defective construction admits of.

## III. ST. PETER'S BARRACK.

This barrack is situated on high ground, overlooking the sea, about 5½ miles from St. Helier. The position is perfectly open and healthy, with ample facilities for drainage. The buildings are in detached blocks on an area of 20 acres, which is very large in proportion to the present number of men. The plan is intended to accommodate a battalion when complete. There is no barrack enclosure.

The men's accommodation consists of four substantially built, detached, one-story houses resembling huts; each containing four barrack-rooms and two serjeants' rooms. The men's rooms are 30 feet long, 17 feet 9 inches wide, and 12 feet 6 inches high, carried up into the roof, which is double, and has a partial ceiling. Each room has two windows, one at either end, and the beds are ranged along the side walls. There is an inner porch, giving entrance to every two rooms. There are 16 rooms in all, with regulation space for 13 men per room at 512 cubic feet per man. The accommodation is as follows:—

| Rooms. | Total present Regulation Number of Men. | Total Number of Men at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 16 | 208 | 176 | 32 |

There is space in each room for 11 men at 600 cubic feet each, instead of the present number 13.

The total deficiency is for 32 men, which could be readily supplied by the erection of one additional house of two rooms.

Each room has a shaft for ventilation built in the chimney stack, but there are no inlets. There should be two, one at each end of the room over the windows, and the present large wasteful fireplace should be replaced by a remodelled grate to warm part of the admitted air. The warm air inlet should be placed at as great a distance as possible from the ventilating shaft. The serjeants' rooms require Arnott's ventilators in the chimnies.

Gas is not available for these barracks, and candles are used for lighting at night.

There is no day-room; but there is a good library and reading-room formed out of the canteen block after the canteen was given up. The room is also used as a school-room, and becomes a reading-room after school hours. The books, which are obtained from the garrison library at Fort Regent, are kept in a separate room. This school and reading-room requires two shafts through the roof and four inlets, two on each side; also better means of warming. Other rooms in the same building are used as married quarters.

The ablution accommodation is excellent and ample. There are two ablution-rooms, with granite tables, basins, gratings, pegs, and water. There are swing windows, but it would be an improvement in ventilation to put louvres in the roof.

There is no bath. Two would be required for the present number of men in barracks.

The wash-house is good, but incomplete. It requires fixed tubs and a drying closet.

There are two good recently-constructed cook-houses with ovens. They require roof ventilation.

There are no cleaning-rooms and no covered sheds. A shed would be a great improvement in so exposed a position.

The only workshop is a tailors' shop in a range of buildings at the lower end of the parade ground. It requires ventilation by an Arnott's valve.

Water is obtained from two wells. No other source is available.

There is no proper drainage. Rain water finds its way off the surface, and there is only one line of drain, which conveys away waste water and discharges it into a hollow about 100 yards from the barrack, whence the drainage escapes down a ravine to the sea. There is no stream in this ravine in dry weather.

The roofs require gutters. The privies are of the usual barrack construction, and are connected with cesspits. They are not supplied with water. They should be reconstructed on Macfarlane's principle, and drained either to an outlet, or their contents removed daily in a cart. It is possible that in such a neighbourhood the privy drainage might be advantageously applied to agricultural purposes, such as irrigating grass land, in a district where manure is very much required.

The guard-room accommodation is good, but might be improved by better ventilation, and means of warming the air admitted. The adjoining four cells are very small, having only a cubic capacity of 505 feet each, or about half what they ought to have. They have means of ventilation by the window, but it is hardly sufficient. A small shaft from each would improve it.

*The following are the Sanitary Improvements required for this Barrack:—*

1. The accommodation to be fixed at 11 men per room.

2. Room ventilation to be improved by an inlet at each end close to the ceiling, and by ventilating grates. Non-commissioned officers' rooms to have Arnott's ventilators. School and reading-room to be ventilated by shafts, inlets, and remodelled grates. Tailors' shop to have Arnott's valve. Guard-room to have a shaft and remodelled grate. Ventilation of cells to be improved.

3. Ablution-rooms to be ventilated, and two baths to be provided.

4. Wash-houses to have fixed tubs and a drying closet.

5. Cook-houses to be ventilated.

6. Privies to be reconstructed as water latrines, with divisions, half-doors, light, and ventilation, and their contents drained away to an outlet, or applied to agricultural purposes. Cesspits to be abolished. All the buildings to have roof gutters.

### *St. Peter's Barrack Hospital.*

This building stands behind the officers' quarters, and rather too close to them. It would have been better to have placed it at a greater distance from the barrack buildings. It consists of a single block, two stories high, behind which is a range of one-story buildings, containing the kitchen, &c., connected with the centre of the hospital by a covered way.

The hospital consists of a centre and two wings. The centre recedes in front, and there is a verandah extending along it between the wings. A good through and through passage and staircase divides the building into two parts. Along the back of the centre there is a glazed passage or corridor on each story. From the ground-floor corridor there enters a surgery and nurses' room on one side, and an itch ward and pack store on the other. At either end of the corridor in the wings is a large ward with five windows, three on the side and one at each end.

Out of the up-stairs corridor there open nurses' rooms, a ward, &c., and in the wings are two wards similar to those below.

There are altogether four large wards and three small wards, with regulation space for about 40 beds. The most important part of the hospital are the four wards in the wings, each having regulation space for eight beds.

The ward accommodation is amply sufficient for the present barrack accommodation; but if St. Peter's barracks be extended to accommodate a battalion, there would certainly not be the requisite amount of hospital space. It would therefore be very advisable, in extending the barrack, to consider the question of hospital accommodation at the same time, with the view of affording the required 1,200 cubic feet per man for the sick.

Ventilation is partly provided for in the lower wards by ventilating beams in the ceilings, and in the upper wards by openings in the ceilings. We would recommend proper ventilating shafts to be supplied to all the wards. The ventilating beams in the lower wards would answer for inlets by enlarging the openings and protecting them by boards so arranged as to throw the inflowing air to the ceiling. The upper wards would require two inlets, one at each end. The smaller wards should have Arnott's valves in the chimnies. All of the wards require ventilating fire-grates for warming the admitted air.

A few perforated glass panes introduced into the top sashes of the corridor windows would improve the ventilation of the whole hospital.

The pack store is very small, and has no racks. Probably another and larger room might be made into the pack store to increase the accommodation.

There is neither water-closet, bath, nor ablution-room. These indispensable parts of a hospital might be provided for in a projection behind the centre of the building.

The privies are behind the kitchen, and are connected with a cesspit and undrained. The effluvia from the privies were so powerful as to taint the air to some distance.

The well from which the hospital is supplied with water is much too close to the cesspit; but the best remedy for this is to abolish the cesspit altogether, to drain the hospital, and convert the privies into a water latrine. The paving and surface drainage behind the hospital are in a bad state, and require relaying. A large ash-pit in the hospital yard should at the same time be removed.

There is no proper hospital enclosure for convalescents.

St. Peter's hospital is the only building in the Channel Islands at all fit for its object. It is, nevertheless, deficient in the important points of accommodation we have mentioned. It is, besides, too small for the projected size of the barrack, and should be improved on such principles as will enable it to be extended when the barrack is made large enough for a battalion.

*The Sanitary Improvements at present required are:—*

1. To allot 1,200 cubic feet per bed in each ward, by removing any excess of beds beyond the number required to give that amount.

2. To ventilate the lower wards in the wings by shafts, and by converting the ventilating beams in the ceilings into inlets as described. To ventilate the upper wards in the wings by shafts and inlets. Arnott's valves to be supplied to all the smaller rooms. Ventilating fire-grates to be introduced into the wards. Passages to be ventilated by perforated glass panes in the upper window sashes.

3. Water-closets, bath, and ablution-room, with hot and cold water laid on, to be provided.

4. Cesspit in the backyard to be abolished, and the privies drained and converted into a water-latrine. Paving and surface drainage to be improved. Ash-pit to be removed.

5. An enclosed exercising ground for convalescents to be provided.

## IV. GRÈVE DE LECQUE BARRACK.

This is a small barrack, about 7½ miles from St. Helier. It consists of five blocks of one story buildings in line, situated on an eminence at the foot of a hill, and immediately overlooking a small sheltered bay, the landing place of which it commands. The hill slope has been cut away, and a platform made to find room for the buildings, and they are rather confined at the back in consequence.

Four of the blocks, having two rooms in each, are used as men's quarters. They are of a similar construction to those at St. Peter's, and have an inside porch, out of which the rooms enter right and left. Each room is 30 feet long, 17 feet 9 inches wide, and 12 feet 6 inches high.

Each room has two windows, one at each end.

The ceilings are carried up into the roof. Each room has regulation space for 13 men, at 512 cubic feet per man. The details are as follows:—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 8 | 104 | 88 | 16 |

The rooms, like those at St. Peter's, should contain 11 men instead of 13.

Each room has a ventilating shaft in the chimney stalk, but there are no inlets, and the old-pattern grate is used for warming.

Inlets should be provided at the eaves, one at each end, and a remodelled fire-grate. The want of inlets appears to occasion down-draughts in the shafts, for in certain of the rooms used as married quarters the shafts were boarded up. It might be advisable to put louvres at the mouth of each shaft, so arranged that any chance down-draught may be thrown towards the ceiling. This precaution is indeed desirable in all upper floors of barracks and hospitals, and also in one-story buildings.

There is no cook-house, and the cooking has to be done in the barrack-rooms.

A kitchen, with a detachment cooking apparatus, should be provided. There is no ablution-room. One should be erected to contain a suitable table and one bath.

Abundance of water for any purpose can be obtained in the vicinity of the barrack. There is a running stream close at hand.

The privies and ash-pit are behind the line of men's rooms. There is no need for their being there at all.

The ash-pit should in any case be removed, and placed in a more open position, if indeed any ash-pit be required. The privies should be drained, and reconstructed as water latrines. At present they are over a cesspit extending the whole length of the building, the boarded floor forming the cover of the cesspit.

The latrine building has no light nor ventilation except by the door.

There is no barrack enclosure.

There is no guard-room. There are four non-commissioned officers' rooms, one of which is at present occupied as a guard-room. All these rooms should be ventilated.

There is no hospital accommodation nearer than St. Peter's.

Taken as a whole this is a good small barrack, so far as it goes; but it requires the improvements stated above, namely:—

1. The regulation number of men per room to be reduced from 13 to 11.

2. Each room to have an inlet at each of the opposite ends, and a remodelled fire-grate. Non-commissioned officers' rooms to be ventilated by Arnott's valves.

3. A kitchen to be built, and means of roasting and boiling rations to be provided.

4. An ablution and bath room, with one bath, to be provided.

5. Privies to be reconstructed as water latrines on Macfarlane's principle, with divisions of seats, half-doors, light, and ventilation. To be drained, and the cesspit cleansed and abolished. Ash-pit to be removed.

## V. BONNE NUIT BARRACK.

This is another small barrack, similar in construction, position, and destination, to the Grève de Lecque barrack. It is situated on the slope of a steep lofty hill, at some elevation above the bay which it commands, at a distance of 5½ miles from St. Helier. A site for the buildings has been obtained by cutting away the hill; but as no precaution had been taken to divert the drainage from the higher ground, it lies on the surface of a narrow pathway immediately behind the barracks. This is a defect admitting of easy remedy by merely cutting a drain of sufficient depth to act as a catch-water.

The quarters are in one line overlooking the sea, and there is a small yard behind, in which are the barrack offices, quarters for non-commissioned officers, stables, stores, &c.

There are six 13-men rooms, each 30 feet long, 17 feet 9 inches wide, and 12 feet 6 inches high. They have one window at each end. The accommodation is for 78 men at 512 cubic feet per man.

The following are the details:—

| Rooms. | Total present Regulation Accommodation. | Total Accommodation at 600 Cubic Feet per Man. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| 6 | 78 | 66 | 12 |

The rooms are ventilated by shafts in the chimney-stalk, but they require, in addition, an inlet at each end close to the eaves, and a ventilating fire-grate.

The privies are over cesspits like those at Grève de Lecque. They can be easily drained, and should be reconstructed as water latrines.

There is abundance of water from a small stream, which runs down the hill at one end of the barracks.

A proper ablution-room and one bath should be provided.

There is no proper cook-house, but cooking accommodation was, some time ago, provided in a building formerly a beer store, not for the barracks, however, but for sick men, at a time when the small barracks, along the coast, were occupied by the men of one regiment. This barrack being the central one, had two of its men's rooms set apart for hospital purposes, and two boilers were put up in the beer store to supply means of cooking. A proper cooking-range should be provided.

This barrack is not enclosed, and has no guard-room.

*The following Sanitary Improvements are necessary:—*

1. Reducing the numbers of men per room from 13 to 11.

2. Improving the ventilation of the rooms by one inlet at each end, and remodelled fire-grates.

3. Draining the site of the barrack, and turning away the water from the higher ground by a catch-water drain carried behind the barrack, and a foot and a half below the level of the parade ground.

4. Draining and reconstructing the privies as water latrines on Macfarlane's principle, and lighting and ventilating the building.

5. An ablution and bath-room with one bath to be provided.

6. A cook-house, with means of roasting and boiling to be provided.

## VI. LA ROZELLE BARRACK.

La Rozelle barrack, like the two preceding ones, is intended for the protection of a small bay situated between lofty headlands, about five and a half miles from St. Helier. It occupies the upper end of the bay, toward which the walls of the rooms are loop-holed, and the walls are carried up above the eaves to form a parapet for defence.

There are six men's rooms, similar to those already described, but their dimensions are different. They are 27 feet long, 20 feet wide, and 12 feet 6 inches high, the ceilings being carried up into the roofs.

Each room has two windows, but they are on one side only, the opposite wall towards the bay being loopholed as already mentioned.

The number of men placed in each room varies considerably. One return gives it as 10, and the space then amounts to 675 cubic feet per man. Another return gives the number as 16, with about 422 cubic feet per man.

At the time we inspected the barrack it was unoccupied, but there were 14 beds in the rooms, giving 482 cubic feet per bed.

The actual available accommodation in each room at, as near as may be, 600 cubic feet per man, is for 11 men, giving 66 men as the total accommodation for the barrack.

The rooms are partially ventilated through the roof, but they require inlets at the eaves, and remodelled fire-grates, to complete the ventilation.

The rooms are in a single line, and form one side of a small square, the opposite side of which is formed by a range of one-story buildings used as stores, stables, guard-rooms, &c. The square is completed by officers' quarters on the third side, opposite which are privies, &c.

Like the other small barracks already described, this one has no cook-house, and no ablution and bath accommodation.

There are two wells with tanks for supplying water.

The greatest defect is the state of the drainage. The paving and guttering require relaying and adjustment of levels. There is a large gulley grate close to the walls of the men's room, with a grating for ventilating the space under the floor exactly over it. This gulley grate should be removed to the end of the line, and the present drain closed up.

The privies are over cesspits; they are of the usual defective construction, and have no drainage. They should be converted into water latrines, similar to those advised for the other barracks.

There is a good guard-room, but it requires a shaft and remodelled grate for ventilation.

There is no hospital accommodation for this barrack.

*The following are the Sanitary Improvements required:—*

1. The usual occupation to be limited to 11 men per room.

2. The room ventilation to be improved by inlets and ventilating fire-grates. Guard-room to have a shaft and remodelled fire-grate.

3. A cook-house, with means of cooking by roasting and boiling, to be erected.

4. An ablution-room with one bat to be erected.
5. Surface drainage and paving to be improved as suggested.
6. Privies to be drained, and reconstructed as water latrines, with divisions, half-doors, light, and ventilation.

Lastly, it would be advisable to consider whether a small hospital in a central position might not be very advantageously erected for receiving sick from Grève de Lecque, Bonne Nuit, and Rozelle barracks, which, at the present time, have space for 264 men, and would require 26 beds at that rate, or 220 men at 600 cubic feet, a number equivalent to 22 sick, for which there is at present no hospital accommodation.

### VII.—MOUNT ORGEUIL CASTLE.

This is a very old and finely placed castle, mounting a few guns, occupying the summit of a rocky promontory, above the Bay of Gorey. Much of the castle is in a state of ruin, and all of it bears the marks of age and disrepair. The few remaining apartments have barrack bedsteads in them, and are on the construction for 51 men. They might be suitable for occupation on an emergency, but they are not in such a state as to be desirable as men's quarters at ordinary times. All are complained of on account of damp, particularly in winter.

This is not a place to spend money on unless it were to be restored, but still as it is a barrack, and liable to occupation, something might be done at a small cost to render the rooms more habitable. With this view, we would propose to introduce the largest sized Arnott's ventilators into the chimnies, and ventilating fire-grates.

There is no cook-house. The boiler is in one of the rooms. A small oven would be an acquisition.

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## ALDERNEY.

The island of Alderney contains 12 barracks, most of them of small size, and accommodating very few men.

The state of the weather, and the short time at our disposal when we visited Alderney, rendered it necessary for us to restrict our inspection to those barracks nearest the harbour, which are the three following :—

Gros Nez,
Tourville,
Chateau d'Etoc.

We also inspected one of the hospitals called the Nunnery, situated between the two latter.

### I.—GROS NEZ FORT.

This is a recently constructed fort at the land end of the new pier, and commanding the entrance to the harbour. The position is open, and ought to be healthy.

The men's accommodation consists of five casemated rooms, each 41 feet long, 18 feet wide, and 12 feet high, having regulation accommodation for 16 men per room, at 553 cubic feet per man. The actual occupation when the return was made up for us was 13 men per room at 680 cubic feet per man.

Each room has windows and loop-holes, two at either end, and two fireplaces. There are no special means of ventilation.

One shaft is required for each casemate, and two inlets, one at either end of the arch. The fire-grates should also be reconstructed on the ventilating plan.

The guard-room requires ventilation in a similar manner.

There is a good ablution-room, with slate tables, gratings, and pegs, but the tables have no beads to prevent the water dashing over on the men while washing. There is no bath.

The cook-house contains boilers and an iron oven.

The latrines are flushed into the sea, but are not water latrines, and are consequently offensive.

Macfarlane's apparatus would remedy the defect. An improved urinal supplied with water is also required.

The water supply is from a tank.

There are several deficiencies in this fort as compared with the larger class of barracks ; but it is not possible in small casemated works, which are intended for a small number of men, and where the space is necessarily circumscribed, to provide everything that is desirable.

Taken as a whole the men's accommodation is better than in the older class of defensible works.

In so far as health is concerned, we would propose as follows :—

1. To restrict the number of men in the rooms at all ordinary times, so as never to give less than 600 cubic feet per man.
2. To ventilate the casemates and guard-room by shafts, inlets, and remodelled fire-grates.
3. To provide one bath, and a bead to the ablution table.
4. To reconstruct the privies as water latrines, and to provide an improved urinal.

### II.—TOURVILE.

This is a large fort, with regulation space for 384 men, situated on a rocky hill to the east of Alderney harbour, and partially surrounded by the sea.

The barrack accommodation consists of blocks of one-story rooms standing within the ramparts, and detached from them. Each room is intended to accommodate 24 men. The rooms are much better than any fort accommodation we have seen. They are in fact spacious barrack-rooms, but they have the disadvantage of the windows being placed at the ends instead of along the sides.

All the rooms have ventilating shafts through the ceiling, and inlets at the ends both above and below.

They are also warmed by Anglo-American stoves.

The only improvement we would suggest in regard to the ventilation would be to close the lower inlets near the floor, to remove the covers from the upper inlets, supplying their places by Sherringham's ventilators of the required area, and to reconstruct the fireplaces to warm part of the admitted air.

Between every two rooms there is a space lighted by a dome light used for an ablution-room. It has slate benches, gratings, and pegs, and is sufficiently lighted, but it requires some permanent means of ventilation at the dome. There is no bath. Four should be provided for the barrack.

There are a number of rooms for non-commissioned officers which require ventilation. Arnott's valves would answer the purpose.

The serjeants' mess is very good, but the ventilating inlets were all closed. A shaft, with Sherringham's ventilators instead of the present tubes, would prevent draughts, the occurrence of which is probably the cause of the present inlets having been disused.

There is a good canteen, but the tap-room is hardly sufficiently ventilated. Sherringham's valves for inlets, and an Arnott's valve into the chimney, would improve it in this respect.

The school-room is rather small, it has ventilators, but they are not sufficient. A shaft and Sherringham's valves instead of the present inlets should be introduced. There should also be a ventilating grate.

The library and reading-room are good.

These buildings are all enclosed by the ramparts, but they are separated from them by a space 10 or 12 feet wide ; and there is a line of casemates under the terreplein, containing the cook-house, privies, &c.

The cook-houses are provided with boilers, and there are brick ovens in separate bakehouses, so that the accommodation in this respect is sufficient. The chief defect in them is the want of sufficient light and ventilation. If the latter could be improved by

a shaft carried up in the chimney, it would be a great advantage. The only source of light available is at the door-end of the casemate, and the most appears to be made of it, except that the light might be increased by Chappuis' reflectors.

The latrines are merely flushed privies, and are very offensive. They should be reconstructed on Macfarlane's principle.

Improved urinals are required instead of the present ones, which are also in an offensive state.

Four women's wash-houses have been provided in as many casemates. They are imperfectly fitted up, and require the usual improvements. One drying closet would be sufficient for all of them.

Within a few feet of the end of a block of men's rooms is the ash-pit of the fort. It is a casemate, and is offensive and unwholesome. It should be removed altogether, and the dust, ashes, and kitchen refuse discharged down a shoot to a place convenient for its removal at the foot of the hill. No ash-pits should be permitted within any of these forts.

There is a good guard-room, with tube ventilating inlets in the walls, which were closed. Those of the lock-up were also closed. Sherringham's valves should be substituted for these tubes, and ventilating fire-grates introduced. The cells are warmed and ventilated, but would be improved by perforated panes in the passage window.

The parade ground appears not to be sufficiently underdrained. It should be done to such an extent as to afford a ready exit for the rain water, the natural escape for which is cut off by the works.

With the exception of the defects here pointed out, this is a very good barrack, and although it is entirely enclosed by the works, its position is elevated and exposed to the winds, and it ought to be healthy.

*The Sanitary Improvements it requires are as follows :—*

1. Affording 600 cubic feet per man, at all ordinary times, in the barrack-rooms.
2. Improving the ventilation by closing up the floor ventilators, substituting Sherringham's valves of sufficient size for the present upper inlets, and reconstructing the fireplaces to admit warmed air to the rooms. Non-commissioned officers' rooms to be ventilated by Arnott's valves. Guard-room to have Sherringham's valves for inlets, and ventilating fire-grate ; also Arnott's valve in the chimney.
3. Ablution-rooms to be ventilated at the roof. Four baths to be provided.
4. School-room to be ventilated by a shaft, and Sherringham's valves for inlets ; also to have a remodelled fire-grate.
5. Serjeants' mess to have a shaft, and Sherringham's valves for inlets.
6. Canteen tap-room to have an Arnott's valve in the chimney, and Sherringham's valves for inlets.
7. Ventilation and lighting of the cook-houses and bake-house to be improved in the manner suggested.
8. Privies to be reconstructed as water latrines. Improved urinals, properly supplied with water, to be provided. Ash-pit to be removed.
9. Women's wash-houses to be properly fitted up with fixed tubs, &c., and one drying closet to be provided.
10. Under drainage of parade ground to be improved.

## III.—CHATEAU D'ETOC.

This fort is placed on a rock on the sea beach, at a lower level than Tourville, and not far from it. The position is open and healthy. The barracks are in one block of building, enclosing the parade ground on two sides. They consist of two floors and a basement, the rooms being entered from passages facing the interior of the court. There are 10 rooms altogether, one of which is in the basement. This room is 8 feet high. Those on the floors above are, some 11 feet, others 12 feet high. They vary from 22 to 30 feet in length, and from 18 to 20 feet in width. They have two, three, and four windows each, according to their dimensions.

There are two rooms for non-commissioned officers.

The barrack accommodation is intended for 120 men, at from 450 to 498 cubic feet per man. The details are as follows :—

| Rooms. | Present Regulation Number of Men. | Number of Men at 600 Cubic Feet each. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| No. 1 | 10 | 8 | 2 |
| „ 2 | 13 | 11 | 2 |
| „ 3 | 10 | 8 | 2 |
| „ 4 | 14 | 12 | 2 |
| „ 5 | 13 | 11 | 2 |
| „ 6 | 13 | 10 | 3 |
| „ 7 | 10 | 8 | 2 |
| „ 8 | 10 | 8 | 2 |
| „ 9 | 14 | 11 | 3 |
| „ 10 | 13 | 10 | 3 |
| Total - - | 120 | 97 | 23 |

There is accommodation for 97 men in these rooms, at less than 600 cubic feet per man. The space will not divide equally, and we have therefore given rather less than the full amount, on account of the open position of the barrack.

None of the rooms are ventilated. They require shafts, inlets at each end, and remodelled fire-grates, and all the passages should have perforated glass panes in the upper window sashes.

The ablution-rooms, women's wash-house, cook-house, and stores are in the basement. The position is a bad one on account of the damp air rising to the men's rooms. The three former should be very freely ventilated by perforated panes. Pegs, and a bead to the table, and one bath are required for the ablution-room. The women's wash-house should have fixed tubs and means of drying linen.

The cook-house has an oven recently erected.

The privies are drained to the sea, but are not supplied with water. They should be reconstructed as water latrines. An improved urinal is also required.

Water is derived from wells, and also from rain-water tanks.

The guard-room should be ventilated by a shaft and remodelled fire-grate of the usual construction.

This barrack is deficient in day-room, school-room, library, and also in other accommodations existing in barracks of a larger class. The space within the walls is too circumscribed to enable these adjuncts to be separately provided, but some temporary accommodation might possibly be set aside when the extent of occupation of the barrack admitted of it.

*We would recommend :—*

1. That the regulation number of men per room be reduced to the extent shown in the table, at all ordinary times.
2. That each room be ventilated by a shaft, inlets, and a remodelled grate. That perforated glass panes be introduced in the upper sashes of the stair and passage windows. That the guard-room be ventilated by a shaft and remodelled grate.
3. The ablution-room, cook-house, and women's wash-house to be ventilated by perforated glass panes.
4. One bath to be provided.
5. Privies to be converted into water latrines, and improved urinal to be provided ; and all refuse to be removed daily from the fort.

### *Alderney Hospital.*

There is no accommodation for sick on the station, except two temporary hospitals, one at Butes, the

other between Tourville and Chateau d'Etoc. The latter of these we inspected, but the former we had not time to visit.

The medical officers, however, concur in stating its general unfitness for the reception of sick. Several sites have been considered on which to build a suitable hospital for all the barracks in the island, and one is likely to answer.

*The Nunnery Hospital*, the one we visited, is a single block of building within high walls, consisting of two floors and an attic. The wards are low, dark, unventilated, and bad. There are no suitable conveniences, neither water-closets, bath, nor ablution-room. There is a wooden kitchen, and cells for prisoners within the enclosure.

The best thing to do with this place would be to ventilate the wards with shafts and inlets, as a mere temporary expedient, and to proceed with the construction of a hospital for the station with the least possible delay.

JOHN SUTHERLAND.
W. H. BURRELL.
DOUGLAS GALTON.

Pall Mall, Jan. 1861.

The Right Hon. the Secretary-of-State for War.

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## REPORTS ON COOKING APPARATUS IN USE IN BARRACK AND HOSPITAL KITCHENS BY MESSRS. WARRINER AND GUERRIER.

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### I. METROPOLITAN BARRACKS' KITCHENS.

#### ST. GEORGE'S BARRACKS.

*Gas Stove.*

*Description.*—9 round enamelled boilers; 1 double roasting oven; 1 stove for frying and boiling hot water.

*Number of Men cooking.*—Average, 350.

*Gas consumed.*—Average 25,000 feet per week.

*Present State.*—Jets out of order and ventilation very bad, causing the consumption of a large quantity of gas.

*Remarks.*—We tried this stove very carefully for one week for men varying in number from 100 to 150.

*For boiling* we ascertained as follows:—

1 boiler will take 30 minutes to boil.
4 boilers about 50 minutes.
9 „ about 2 hours.

To cook 117 lbs. of meat, 14 lbs. of vegetables in 156 pints of water, from 20 minutes to 9, until 12 o'clock, in 4 boilers takes 1,800 feet of gas. Loss of meat, though nearly raw, when cooked, one-sixth.

*For roasting* 76¾ lbs. of meat in the two ovens, from a quarter past 10 until 12 took 1,800 feet. Meat, under-done, lost one-fourth.

The ventilation being out of order the roasting is not a fair test of the oven, as the steam from the meat extinguishes the jets of gas unless the door is kept open. To cook by gas appears easy, but it requires great management; for want of knowledge the men consume too much gas. The same ovens with the same gas would roast 3 cwt. of meat.

#### ST. JOHN'S WOOD BARRACKS.

*Gas Stove.*

*Description.*—6 oblong flat-bottomed boilers, 26 inches long, 16 wide, 16 deep, set in brickwork close to the wall, heated with coal; 2 gas ovens set in 4 inch brickwork, 36 jets in each. Ventilation badly constructed, and broken.

*Number cooking.*—4 companies, 188 men.

*Coals and Gas.*—28 boxes, or 1 ton per week; 480 feet for one baking cost 2*s.* 4½*d.*

*Present State.*—Very good repair except the gas oven.

*Remarks.*—The men do not know how to use the gas; too much heat is generated, upwards of 500 Fahrenheit; the meat being too much done outside, and raw in.

The meat when placed in weighed—

| | lbs. | | lbs. |
|---|---|---|---|
| No. 1, - | 40½ | cooked | 29¼ |
| „ 2, - | 27 | „ | 20½ |
| „ 3, - | 39 | „ | 27¼ |
| „ 4, - | 34½ | „ | 24¾ |
| | 141 | | 101¾ |

For want of proper ventilation the oven door had to be kept a little open. The boilers being flat consume more coal than the rounded bottoms. This might be avoided by setting them as in a ship's hearth, with one fire to the three boilers, using the centre one for potatoes and the side ones for soup.

#### TOWER OF LONDON.

*Gas Stove.*

*Description.*—16 old regulation boilers against walls, top iron; 3 gas ovens of 44 jets each (No. 2.)

*Number cooking.*—10 companies, 47 non-commissioned officers, and 10 drummers.

*Coals and Gas.*—70 boxes, or 5,600 lbs. per week; each baking of 2½ hours takes 330 feet of gas in each oven.

*Present State.*—All the furnace doors broken, brickwork very bad, kitchen very badly drained; easily improved.

*Remarks.*—Only 1 company of 31, and the 10 drummers baked in the two ovens, consuming 660 feet of gas, at a cost of 3*s.* Under proper control, they ought to have baked in one oven, which would have cost only 1*s.* 6*d.*; the same quantity of gas would have cooked for 6 companies.

The meat was placed in the oven at half-past 9 and taken out at 12; the heat of the oven was upwards of 400° Fahrenheit, being too hot. One mess of meat when put into the oven weighed 23¼ lbs., when taken out 15 lbs., thus showing too great a loss from excess of heat.

The men are changed weekly, and just as they are beginning to know the oven they leave it; if they knew how to use it they would consume one-half less gas. (*Vide* General Report, fig. 22.)

*Artillery Kitchen.*

*Description.*—2 large and 1 small old regulation boilers.

*Number cooking.*—31 men, never exceed 50.

*Coals.*—7 boxes, or 560 lbs. per week.

*Present State.*—Good.

*Remarks.*—Very intelligent and good cook; the men complain of having no oven, and cannot send their meat out to be baked.

*Hospital.*

Now under alteration.

#### MAGAZINE BARRACKS, HYDE PARK.

*Description.*—3 old boilers and 1 small oven.

*Number cooking.*—47 men.

*Coals.*—7 boxes, or 560 lbs. per week; the oven takes about 50 lbs. per day.

*Present State.*—Furnace doors broken, oven new.

*Remarks.*—Oven very much liked by the men.

*Guard Room.*

2 of Soyer's stoves in good order; consume 1 bushel of coke per day.

### Knightsbridge Barracks.

*Cook House*, No. 1, E.

*Description.*—5 old regulation boilers and 1 small oven, 24 inches wide, 22 inches high, 22 inches deep.
*Number cooking.*—73 men.
*Coals.*—14½ boxes, or about half a ton per week. Oven takes about 140 lbs. per week.
*Present State.*—1 boiler cracked; door frames cracked.
*Remarks.*—The oven burns cinders, but is not large enough. The range is used for serjeants' mess; separate fuel.

*Cook House*, No. 2, E.

*Description.*—6 old boilers.
*Number cooking.*—60 men.
*Coals.*—10 boxes, or 800 lbs. per week.
*Present State.*—Door frames broken.
*Remarks.*—Ventilation of kitchen very bad; requires oven.

*Cook House*, No. 3, E.

*Description.*—6 old boilers.
*Number cooking.*— 60 men.
*Coals.*—10 boxes, or 800 lbs. per week.
*Present State.*—In good condition; requires oven; ventilation not good.

*Cook House*, No. 4, E.

*Description.*—5 boilers and oven, as No. 1.
*Number cooking.*—70 men.
*Coals.*—15 boxes, or 1,200 lbs. per week; oven 2 boxes, or 160 lbs. of coals per week.
*Present State.*—Good.
*Remarks.*—Oven not large enough; it burns cinders.

### Kensington Barracks.

*Cavalry.*

*Description.*—3 large round enamelled boilers, 1 oven, 24 inches wide, 20 high, 27 deep.
*Number cooking.*—48 men.
*Coals.*—6 boxes, or 480 lbs. per week; oven takes 160 lbs. per week.
*Present State.*—New, and in good repair.
*Remarks.*—Kitchen very dark. Top shelves of oven only hot.

*Infantry.*

*Description.*—2 kitchens, each containing 2 excellent hot plates and ovens, the same size as above, with hot water boilers for baths, and one having 4 round enamelled boilers.

These are not used, by order of the Commander-in-Chief, in consequence of the kitchens being so very low, and the large surface of heated iron in them making them unbearable.

The ovens are remarkably well made; they are useless here, but would be invaluable in officers' messes, or in many barracks.

4 boilers are removed to out-house.
*Number cooking.*—100 men.
*Coals.*—11 boxes, or 880 lbs.
*Present State.*—Furnace and soot doors badly set, and out of order. A small oven wanted. [Since supplied.]

### Regent's Park Barracks.

*Description.*—14 square flat-bottomed boilers, 22 inches long by 16 wide, double oven.
*Number cooking.*—4 companies of 30, or 120 men.
*Coals.*—20 boxes, 1,600 lbs. per week, 80 lbs. for each baking.
*Present State.*—Oven been up 6 weeks, requires to be cleaned every 20 days; very well kept. Boilers rather out of order.
*Remarks.*—These barracks often have 8 troops of 30, and then the oven is not large enough, as the men have to send out to bake. [Another oven since added.]

The men are very ignorant in cooking, and there is consequently great waste.

### Buckingham Palace Barracks.

*Description.*—A very small room containing a new stove 7 feet long by 3 feet wide, having 2 ovens and 2 boilers.
*Number cooking.*—37 men.
*Coals.*—90 lbs. per day for 3 meals.
*Present State.*—Quite new.
*Remarks.*—A very good stove for the number; the ovens are unequally heated, but, with proper care, act well. The stove is too large for the room without proper ventilation, there being upwards of 50 superficial feet of heated iron in a room not 14 feet square, and only two square feet of ventilation at the top. In summer it will not be habitable; there ought to be ventilation at the bottom and at the top. [Since done.]

### Portman Barracks.

*Description.*—6 large boilers.
*Number cooking.*—300 men.
*Coals.*—30 boxes, or 2,400 lbs. per week.
*Present State.*— Very bad.
*Remarks.*—2 companies boil in one boiler. 3 boilers for soup and 3 for potatoes. 1 lb. of potatoes for each man. Only large enough for 6 companies.

### Horse Guards.

*Cavalry.*

*Description.*—2 round *copper* boilers, with copper potato steamer, well set in brickwork with stone top. Furnace doors, new pattern and good.
*Number cooking.*—1 troop.
*Coals.*—1 box, or 60 lbs. per day.
*Present State.*—Very good.
*Remarks.*—The coppers boil within 20 minutes. The men change every day, some good cooks, others very bad, they have only 2 hours to cook their dinners. The boilers being copper should be examined from time to time to see if they require tinning.

*Infantry.*

The same as the above.

### Wellington Barracks.

*Up Stairs.*

*Description.*—2 kitchens, 8 boilers in each, and 1 brick oven in each. [Since removed.]
*Number cooking.*—577 men.
*Coals.*—70 boxes, or 5,600 lbs. per week.
*Present State.*—Out of order.
*Remarks.*—Oven holds 16 tins of 17 inches long, 13 inches wide; each oven takes 1 box and a half of coals to heat it. Fire lighted ¼ before 7.

*Kitchen, Down Stairs.*

4 of Soyer's stoves.
2 companies.
2 bushels of coke per day.
} [Since removed.]

### New Oven, Wellington Barracks.

*Results of Trial made on March 8th, 1859.*

*Description.*—Iron oven with two shelves, boiler at back.
*Number cooking.*—3 companies, or 160 men.
*Weight of Coals.*—50 lbs.
*Present State.*—In use 3 weeks; 1 soot door broken; bottom plate buckled in two places.
*Remarks.*—Weight of meat,—

| | Before roasting. | When roasted. |
|---|---|---|
| No. 1 | 42¾ lbs. | 32½ lbs. |
| „ 5 | 36¾ „ | 29¾ „ |
| „ 9 | 40½ „ | 27½ „ |

The reason that Nos. 1 and 9 appear to have lost more in roasting, is that they consisted of more mutton, and that necks.

Fire lighted at 9, meat placed in at ¼ to 10, and done by ½ past 11.

The oven bakes very well, and could have baked for another company with the same quantity of fuel; and we believe if it was a foot higher, so as to bake for six companies, it would not consume more than 10 lbs. more coal.

The ventilation is very good.

The hot water boiler at the back is a failure; the water not more than 60° Fahr.; it is a detriment to the oven, the bottom plate is not thick enough, it should be a much larger gauge. Though new, it has buckled,* which will cause it to crack like many we have seen in the waste stores of Aldershott and Shorncliff. There would be no harm in having a thicker plate, screwed underneath, immediately over the fire. We are fearful that, as the door is at present constructed, it will soon crack. [This oven has been replaced by one of the new pattern.]

There are some men in the kitchen who are good cooks; they are kept there.

### Basement Story Kitchen, Wellington Barracks.

*Result of Trial made on March 8th*, 1859.

*Description.*—2 small gas ovens, made by Smith and Phillips; 4 of Soyer's stoves.

*Number cooking.*—2 companies, 109 men.

*Quantity of Gas and Coke.*—175 feet of gas; three-quarters of a bushel of coke.

*Present State.*—Quite new.

*Remarks.*—Weight of meat:—

| | Before roasting. lbs. | When roasted. lbs. | lbs. | |
|---|---|---|---|---|
| No. 3. | 41¼ | 26 | 3 | dripping. |
| „ 7. | 39¾ | 28½ | 4 | „ |

Meat placed in quarter to 9, taken out quarter to 12. The oven would not hold more, and requires more ventilation.

The old brick oven cooked with 120 lbs. of coal for 114 men.

| | Weight of Meat raw. lbs. | Weight of Meat cooked. lbs. |
|---|---|---|
| No. 6. | 45 | 40 |
| „ 8. | 40½ | 30 |

The same quantity of coals would have cooked for 6 companies.

### The new Boilers in the Wellington Barracks.

As you are cognizant of their construction, there is no necessity to describe them. We must say that we are disappointed in the result. When we saw them in the course of erection, we thought that a very great saving would be effected. We attribute the cause in a very great measure to the men, who, knowing it is done to effect a saving in coals, try to burn as many as they can.

We would suggest that a still greater reduction of the fire-place be made, but the most effectual plan, in our opinion, would be as follows; which would at the same time prevent the furnace door breaking (there are already 4 broken, after being up only three weeks, and in the new permanent barracks at Aldershott *nearly all* are broken, resulting from the expansion and contraction of the iron). Our plan would be to contract what would be called the fire-box; make it in 2 pieces of Stourbridge clay; bring the furnace door out level with the brickwork, have a *dead plate* between the furnace door and the box, the door to be formed the same way as the furnace door, but not of the same material, (cast doors should be avoided as much as possible in barracks); it should be of fluted iron in wrought-iron frame; it would allow of expansion and contraction, and not be liable to break by being knocked off. It might be easily tried by employing fire-bricks instead of Stourbridge clay.

* Within one month it had to be taken down, and the bottom renewed.

### Duke of York's School.

*Description.*—4 large pans heated by steam at 7 lbs. pressure, 3 ovens on Count Romford's system.

*Number cooking.*—500 boys.

*Coals.*—No limit, but about 400 lbs. per day.

*Present State.*—Very good and kept in good order. Steam perfect. One oven burns out every year.

*Remarks.*—Permanent cooks. Qy. Would not two boys employed in the kitchen by turns give them some idea of cooking? [Since done.]

### School Hospital.

*Description.*—2 large pans by steam. Grate for roasting.

*Number cooking.*—50 to 60.

*Coals.*—No limit.

*Present State.*—All in good condition.

*Remarks.*—Lavatory contains a bain marie. Boiler on a good plan.

### Chelsea Hospital.

*Description.*—3 coppers and large roasting range.

*Number cooking.*—470.

*Coals.*—Unlimited.

*Present State.*—Old-fashioned large copper boiler; very questionable.

*Remarks.*—The cooking is good; being done by permanent cooks, who do their duty with ease and system.

## II. KITCHENS AT CHATHAM, BROMPTON, WOOLWICH, &c.

### Fort Pitt.

*Description.*—Gas stove by Deane, consisting of oven set in brickwork, and a plate with 6 burners. The oven contains 44 nipples, burning 3 feet of gas each per hour; a stack of 3 square flat-bottom pans; 2 stacks of oval ones; small oven in scullery.

*Number cooking.*—From 300 to 500 men, about 160 full diets.

*Coals and Gas.*—30 boxes or 2,400 lbs. per week. Oven, 2½ hours' roasting, consumes about 300 feet of gas without top plate.

*Remarks.*—The gas stove is the ordinary stove without the modern improvements. The oven is like those at St. George's barracks, &c. The 3 flat bottom boilers being set and used together daily, might be set with one furnace, in the same way also the oval ones two together; this would save a large quantity of coals. The use of Dr. Edwards', or Pettits' or Jones' burners for the gas on the plate would save 40 per cent. of gas.

The roof requires ventilation.

The kitchen is the cleanest we have seen; the cook likewise; he has been here 4 years; he requires a knowledge of the fundamental rules of cookery.

With the numbers varying we question if steam would be economical.

### Chatham Garrison Hospital.

*Description.*—A gas stove with double oven; a plate with large burner, 1 oval, and 2 small ones made by Phillips. A small range; 6 oval boilers set against wall, and a small oven.

*Number cooking.*—250 to 300 men.

*Coals and Gas.*—1,300 lbs. per week. 700 to 800 feet of gas per day; since the regulators have been up the gas has not been strong enough.

*Present State.*—Gas oven well ventilated. Boilers in a bad state; 2 without soot doors; obliged to clean out with gunpowder every other day.

*Remarks.*—The gas ovens are each 28 inches square, and contain 90 jets each; the jet consumes 1 foot per hour. The top of stove is not good, it cannot be properly cleaned; it should have the new burners.

A serjeant cook; he has been here 3 years; a very good cook.

### Brompton Hospital.

*Description.*—A small gas stove by Deane. Oven set in brick ; 32 nipples in oven, 5 burners on plate. 2 stacks of boilers with 16-square flat bottom boilers, and 2 oval, and another with 7 flat, 1 oval, and a hot plate.

*Number cooking.*—80, with the orderlies.

*Coals and Gas.*—12 boxes of coals per week ; about 500 feet per day, that is, 300 for roasting and 200 for boiling.

*Remarks.*—Ventilation good ; a young cook ; stacks of boilers useless.

### Melville Hospital.

*Description.*—3 very large iron boilers, a roasting range, a kind of Flavell with 2 ovens and a hot-water boiler.

*Number cooking.*—150 to 230 men.

*Coals.*—21 boxes or 1,680 lbs. per week.

*Present State.*—Good, the range requires constant repair.

*Remarks.*—The 3 boilers cook soup, potatoes, or barley water. The range roasts all the joints, and ovens bake the puddings. Flues require cleaning out every two days. Cook been here 40 years, allowed one assistant. Iron enamelled saucepans, which they prefer to tin. [This range has since been replaced by a Flavell's kitchener.]

### St. Mary's Invalid Depôt and Hospital.

Two kitchens in casemates, both alike, one for hospital and 1 for convalescents, each containing 20 oblong flat bottom boilers, 26 inches long, 16 wide, 16 deep, built against wall in 4 stacks of 2 each, and 3 stacks of 4 each. [2 boilers since removed and a brick oven erected.]

*Number cooking.*—About 400 men.

*Coals.*—36 boxes.

*Present State.*—No soot doors, and sweeps have to be employed to clean them ; ventilation good ; hospital kitchen cooks for about 140 men ; coals unlimited ; permanent cook.

### Chatham Barracks.

#### *No.* 1 *Cook House.*

*Description.*—1 stack in middle of kitchen with 3 flues, having 5 oval and 12 flat boilers.

*Number cooking.*—300 men.

*Coals.*—30 boxes or 2,400 lbs. per week.

*Present State.*—All out of order and badly set.

#### *No.* 2 *Cook House.*

*Description.*—1 stack of 5 oval and 9 flat boilers, various sizes.

*Number cooking.*—670 men.

*Coals.*—43 boxes or 3,440 lbs. per week.

*Present State.*—No soot doors, some boilers will not heat, doors broken, &c., &c.

*Remarks.*—See "General Observations."

#### *No.* 3 *Cook House.*

*Description.*—1 stack in middle of kitchen of 12 flat, 30 inch long, 15 wide, 15 deep ; and 2 oval, 28 inches long, 16 wide, 16 deep, with 3 flues.

*Number cooking.*—329 men.

*Coals.*—32 boxes or 2,560 lbs. per week.

*Present State.*—No soot doors, and out of order.

#### *No.* 4 *Cook House.*

*Description.*—1 stack in centre of kitchen, 14 oval boilers, with one flue.

*Number cooking.*—300 men.

*Coals.*—30 boxes or 2,400 lbs. per week.

*Present State.*—Lids bad and brickwork bad.

*Remarks.*—No places in any of the cook-houses for coals, and consequently the places are dirty.

#### *Bake House.*

*Description.*—2 seven-bushel ovens, erected by Smith.

*Number cooking.*—Bakes 39 dishes in each oven without *topping.*

*Coals.*—14 boxes or 1,120 lbs. per week.

*Present State.*—Very excellent, cannot be better. The small consumption of coals is because both ovens are not used every day.

To *top* as they do in London, these two ovens would bake 1,872 dinners per day.

### General Remarks on Chatham Barracks.

There are 4 cook houses, containing 59 boilers and furnaces, capable of cooking without the oven for 4,000 men, now cooking for 1,600. The barracks will only hold 2,500 men. If instead of these 4 cook houses and 59 boilers and furnaces, which consume with the oven 7½ lbs. of coal per head per week, there was erected one large kitchen in connexion with the ovens under proper control and management, and a small number of boilers set either double or treble, and a proper place for coals, we have no hesitation in saying it would effect a very great saving, and add to the comfort of the men ; and Chatham being a depôt, would be an excellent place for them to learn how to cook. Any large apparatus that will not adapt its consumption of fuel according to numbers, will not do for depôt barracks.

### Brompton Barracks.

#### *No.* 1 *Cook House.*

*Description.*—2 stacks in middle kitchen ; 1 of 6 flat, and 2 oval boilers ; and 1 of 7 flat, 1 oval, and hot plate.

*Number cooking.*—254 men.

*Coals.*—26 boxes, or 2,080 lbs. per week.

*Present State.*—Doors out of order, and lids very bad, and all sizes and shapes.

*Remarks.*—See "General Observations" on Chat ham barracks.

#### *No.* 2 *Cook House.*

*Description.*—2 stacks of 12 flat-bottomed boilers.

*Number cooking.*—36.

*Coals.*—5 boxes, or 400 lbs. per week.

*Present State.*—All out of order.

#### *K Cook House.*

*Description.*—8 oval boilers ; 4 small brick ovens cannot be used.

#### *L Cook House.*

*Description.*—2 stacks in middle of kitchen ; 1 of 5 square, and 3 oval boilers, and 1 of 8 flat boilers, and hot plate.

*Number cooking.*—73 men.

*Coals.*—18 boxes, or 1,440 lbs. per week.

*Present State.*—Out of repair.

*Remarks.*—Use 6 boilers, and bake four times in the week out in the town.

#### *D Cook House.*

*Description.*—2 stacks of 8 flat boilers each, in middle of kitchen.

*Number cooking.*—113 men.

*Coals.*—10 boxes, or 800 lbs. per week.

*Present State.*—Good, but lids bad.

*Remarks.*—Use only six boilers, bake often out.

#### *North Square Cook House.*

*Description.*—2 stacks in middle of kitchen of 6 oval boilers each ; 1 brick oven about 10 feet square, built by Smith and Sons.

*Number cooking.*—No particular number, as they cook for others.

*Coals.*—15 boxes, or 1,200 lbs. for oven per week.

*Present State.*—All in good order.

*Remarks.*—A permanent cook, who charges one-halfpenny for each baking ; average bakings, 50 per day. Several companies in the barracks send here to bake. If an oven is erected for the use of a particular barrack it should be so used, like the Chatham and

Marine barracks; no other cooking should be with it, as it creates confusion.

*Huts, No. 1.*

*Description.*—7 oval boilers against wall.
*Number cooking.*—121 men.
*Coals.*—10 boxes, or 800 lbs. per week.
*Present State.*—Very good and clean.
*Remarks.*—4 boilers only used; bake out.

*No. 2.*

*Description.*—7 oval boilers.
*Number cooking.*—174 men.
*Coals.*—17 boxes, or 1,260 lbs. per week.
*Present State.*—Doors out of order.
*Remarks.*—Bake out. Good hut kitchens.

*Field Stove.*

Idea good, but the stove not properly made.

### Chatham Marine Barracks.

*Cook House.*

*Description.*—3 very large boilers set separate.
*Number cooking.*—730 men altogether in barracks.
*Coals.*—20 boxes for the boilers.
*Present State.*—Very old fashioned.
*Remarks.*—One-third of the men cook in their rooms, and more than one-third bake.

*Bake House.*

*Description.*—2 twelve-bushel ovens.
*Number cooking.*—From 40 to 80 tins of 12 each.
*Coals.*—16 boxes, or 1,280 lbs. per week.
*Present State.*—Very good.
*Remarks.*—The baker has been here seven years. No bread baked, although there is every convenience. All kinds of pies and stews are cooked in it. The marines are supposed to live the best; they mess in rooms of 12 each. If the bakehouse and cookhouse were close to each other, separate, but so as to be under proper control, small boilers instead of large, and a good hot plate, it would be a great improvement, and be better for the men instead of cooking in their rooms.

## WOOLWICH.

### Hospital.

*Description.*—Two kitchens. No. 1.—6 oval boilers (not used), hot plate 6 feet by 4 feet; 1 small iron oven 2 feet by 2 feet, with separate fire, not large enough; and 3 oval boilers, hot plate, and oven, as above, not used. Boilers without steam escapes, and boil in half an hour.

No. 2.—Orderlies' kitchen, with 2 boilers, oven, and range, not used.

*Number cooking.*—Very seldom under 450. There are 76 wards. Messes from ½ lb. to 8 lbs.

*Coals.*—Oven and boilers take 80 lbs. each per day.

*Present State.*—Requires repairs.

*Remarks.*—A very great alteration is required, not only in cooking the food, but in its distribution when cooked. The tins in which the food is served are in such a state as to disgust a sick person. They ought to be enamelled iron dishes in 3 sizes.

[These two kitchens have since been entirely remodelled.]

### Sappers' Huts.

*Description.*—3 oval boilers, 25 inches long, 19 inches wide, 19 inches deep; 1 brick oven holding 1 bushel.
*Number cooking.*—60.
*Coals.*—10 boxes, or 800 lbs. per week.
*Present State.*—Good, and oven very good.

### Marine Barracks.

*Description.*—26 kitchens containing 1 common range and 1 boiler each; boiler set in fire-place, with separate fire.
*Number cooking.*—1 mess of 20 to each room.
*Coals.*—2 boxes, or 160 lbs. to each room.
*Present State.*—Very good; the men sit in the kitchen, and have their meals there.
*Remarks.*—They have soup but twice a week, the other days they bake in 2 very excellent 12-bushel ovens in the barracks; if there was one kitchen with small boilers heated by one fire it would be a great saving, as the fires in the rooms would not be required to be lighted in the summer. The ovens take 940 lbs. coal per week.

### Marine Hospital.

*Description.*—A 4 ft. 6 in. range, a kind of Flavell.
*Number cooking.*—300 men.
*Coals.*—21 boxes or 1,680 lbs. per week.
*Present State.*—Good; but boilers want proper dampers to regulate the fire.
*Remarks.*—A female cook. The soup not being made in the proper way causes the meat to be tough. One regular and proper system ought to be adopted by all hospital cooks. The tin saucepans are very much complained of. A common bain marie to place on the hot plate would be a great convenience.

### Huts on Common.

*No. 1, Cook House used as Hospital Kitchen.*

*Description.*—8 oval boilers with steam escapes; 1 range.
*Number cooking.*—59 and 28 men.
*Coals.*—14 boxes per week.
*Present State.*—Only 4 boilers used; the tins on the range in a bad state.
*Remarks.*—Great want of arrangement and order, and very dirty. [Oven since added.]

*No. 2.*

*Description.*—8 oval boilers and 1 iron oven, 1 ft. 8 in. wide, 2 ft. deep, and 3 ft. high.
*Number cooking.*—300 men.
*Coals.*—1,800 lbs. per week.
*Present State.*—Good.
*Remarks.*—Men complain of boilers being badly set; occupied by Military Train; the men good cooks.

*No. 3.*

*Description.*—8 oval boilers.
*Number cooking.*—200 men.
*Coals.*—1,400 lbs. per week.
*Present State.*—1 boiler cracked.
*Remarks.*—Boilers badly set, and consume a large amount of coal.

*No. 4.*

*Description.*—8 oval boilers and oven, like No. 2.
*Number cooking.*—300 men.
*Coals.*—2,000 lbs. per week.
*Present State.*—Hole in bottom of oven.
*Remarks.*—Oven badly constructed; steam escapes; and boilers not used by the men. [Oven since renewed.]

### Woolwich Barracks.

*No. 1. Right Wing.*

*No. 3. Left Wing.**

*Description.*—16 regulation oval boilers in one stack.
*Number cooking.*—1,200 men.
*Coals.*—4,480 lbs.
*Present State.*—Doors out of order and dirty.
*Remarks.*—14 companies of 25 to 28 each, cook in 4 coppers. Bake out 3 times in the week. The coals do not last through the week.

* In this is now erected Radley's stove.

*No. 5.*

*Description.*—2 stacks of 14 oblong flat boilers.
*Number cooking.*—600 men.
*Coals.*—4,800 lbs.
*Present State.*—Clean and in good repair.
*Remarks.*—Kitchen very light. 4 tanks, but only one having water. The boilers might be reset with advantage, and iron ovens introduced, like the Regent's Park barracks.

*No. 7.*

*Description.*—One stack of 10 oval boilers with 1 flue.
*Number cooking.*—750 men.
*Coals.*—2,400 lbs.
*Present State.*—Good.
*Remarks.*—Bake out every day. Not allowed to steam in the boilers. 3 companies mess with one boiler.

*No. 8.*

*Description.*—Two stacks of small square boilers.
*Number cooking.*—500 men.
*Coals.*—2,000 lbs.
*Present State.*—Bad.
*Remarks.*—These boilers, as set, burn a large quantity of coal; might be set to burn ¼th. Bake 3 times a week. [Since pulled down and Benham's apparatus erected.]

*No. 9.* The same as *No. 7.*

*No. 10. Rear Range.*

*Description.*—One stack of flues, 24 oval flat boilers, one a double one, 5 of them have flush doors, which are not broke.
*Number cooking.*—400 men.
*Coals.*—3,200 lbs.
*Present State.*—Not very good.
*Remarks.*—Bake out very often. Boilers badly set and consume a large quantity of coal.

[This building has been pulled down and a new kitchen erected, containing 8 wrought-iron boilers, 1 Dean's patent oven.]

## III. KITCHENS AT SHORNCLIFF CAMP, HYTHE, &c.

Visited the various kitchens in company with Mr. Elliott, of the engineers' office.

*No. 8 C* used by the engineers, containing one stove made from old materials; one of Sadlier's stoves; two of Soyer's stoves, and two cottager's stoves.

The first of these stoves is formed of brick. Top plate of iron, and pans of galvanized iron. All the pans boil at the same time; the quantity of fuel used is small, the exact quantity not known. Several trials had to be made to obtain the proper height for the bottom of the pans, so that they should cook properly.

*Sadlier's Stove.*

A square iron stove with two ovens and hot plate.

This stove is portable, but not strong enough for soldiers' use; it consumes very little fuel. The same plan of oven might be used with Captain Grant's apparatus.

*Soyer's Stoves.*

Two of these are placed in this kitchen; they are not strong enough for barrack use; the fire box wears out in three months; in most cases Mr. Elliott has replaced them with fire brick; they ought to be made of Welsh lump.

Proper instructions should accompany these stoves; the men do not know how to use them, and, like everything that is not properly understood, they are quickly destroyed. They consume very little fuel, but are not fit for permanent barracks as now constructed. The fire-place is good, being on Dr Arnott's plan, and might be introduced into barracks with the present boilers.

These stoves or boilers were suggested by the late M. Soyer, on the plan and description of one by Count Romford in his Essay, No. 10, pages 285, 293.

Two of the Cottager's stoves are in this kitchen; they are not strong enough. In two months they are destroyed, the oven gives way first; they consume a large amount of fuel.

Mr. Elliott has been making use of the pans for other apparatus.

The men do not like them.

No. 32 C.

Four of Soyer's stoves; six cottager's stoves. Cooks for 180, all in Soyer's stove; the consumption of fuel small.

No. 18 D.

A stove erected by Mr. Elliott from old materials. Known as Captain Lemprier's.

*Description.*

Eight ovens. Sixteen pans, 16 inches by 13 inches.

It was cooking for 240 men; it has cooked for 750.

This is rather too complicated for barrack use, and the same faults attend it as those of Captain Grant's.

No. 42 D. *Cook House.*

10 of Soyer's stoves. Cooks for 180, and not all in use. The consumption of coal very small. The men like them very much, particularly for tea.

No. 42 E.

6 of Soyer's stoves, 4 cottager's, cooking for 269 men; 69 of them belong to the military train.

These men appoint a man who understands it and who cooks well; he says they are the best he ever used, but he has not worked one of Grant's.

*Royal Artillery Cook House.*

This is another stove erected by Mr. Elliott from old material; it is an improvement on the one in No. 8 C, having the oven at the end instead of the side; it cooks very well, and effects a saving of fuel.

No. 42 B. *Cook House.*

4 of Soyer's stoves, 6 cottager's. Cooks for 130, mostly in Soyer's stoves, saves fuel.

No. 8 E. *Cook House.*

4 of Soyer's stoves, 6 cottager's. Cooks for 200. We found here that the cottage stove consumes double the quantity of coal that Soyer's does.

No. 18 E. *Cook House.*

Grant's new stove not yet in use.

Fire lighted for the first time this morning at half-past seven. The oven not hot enough at half-past ten.

Mr. Elliott has been obliged to strengthen the chimney with iron braces, all of them will have to be done in the same way, he has likewise made some modifications in the setting.

The hot plate breaks as soon as the first fire is lighted.

No. 32 E. *Cook House.*

5 of Soyer's stoves, 5 cottager's. The cottage ones out of order.

No. 32 B. *Cook House.*

Grant's stove with 12 pans and oven. Cooks for 550. This is the only stove of Captain Grant's at present in use in the camp, it is worked by the 11th Hussars. There is a corporal in charge of it.

The men find that it takes the same quantity of fuel to cook for 300 as it does for 500.

There is great difficulty in getting the men to use the pans with care, in addition to the injury they

receive from being cleaned under the water taps outside; they also use them to carry coals, and even for worse purposes.

The chimney has sprung and been obliged to be braced up.

The fires are banked up at night.

[Some of these cook houses have been since altered, and 5 of Grant's stoves with ovens are now erected. The allowance of 12 ounces per head per day lasts only 5 days, and in no case will the allowance of coal permit the men to bake.]

### Shorncliff Barrack Hospital.

Kitchen. This is fitted up by Jeakes with 4 double case pans and 1 single ditto, to hold 50 gallons, capable of cooking for 200, which consumes 28 boxes or 1 ton of coals, and 2 chaldrons of coke per week.

The boiler heats the water for the use of the house, bath, &c., by a coil in a 50-gallon cistern.

The kitchen has an open range with oven too small, and the tin pans not adapted for the range fire.

This range requires alteration.

[This has since been removed and a kitchener added.]

The steam apparatus is excellent, and ought to be used for heating a bain marie, to cook rice, milk, beef tea, &c., &c., which could be done without any additional expense of fuel.

### Hythe Barrack Hospital.

This is a new stove 5 feet long, erected by Benham; not being completed we could not try it, but should very much like to have done so, it being erected on a new plan, which we think will be better adapted for hospitals than many we have seen.

[Since tried, it works well and supplies hot water for baths.]

### Hythe Barrack Cook House.

Eight regulation boilers, separate fire-places in very bad repair; they cook for 240 men, and consume 1,940 lbs. of coal per week, and give no hot water for the house. The troops bake for one-third in the town. A brick oven is to be erected.

[Since erected; it takes 100 lbs. of coal to heat it.]

### Sunderland and Twiss Forts, Hythe.

Two forts for 56 men each. Two stoves made from old materials by Mr. Elliott, like the one in No. 8 C, Shorncliff; the flue goes into an old brick one, not so good as the one at Shorncliff.

## IV. KITCHENS AT WALMER BARRACKS.

### South Barracks.

Kitchen cooks for 232 men.

This kitchen is badly arranged, the oven is too small, the boilers want resetting, and 680 lbs. of coal per week is not sufficient.

The other kitchen is exactly like this, and both are kept in very bad order. The men change every month, and being recruits the cooking is bad, and waste great.

### Cavalry Barracks.

3 separate boilers, and brick oven just erected, not yet used.

### Walmer North Barracks.

Cooks for 350 men of various regiments.

In addition to the above are boilers and a range erected at the side of the kitchen.

They burn the full allowance of fuel. We consider that they could be easily reset to burn one-third less fuel. Oven consumes 110 lbs. coal.

### Hospital Kitchen, North Barrack.

This has been originally erected on the same plan as the above, there being 6 boilers in the centre and 4 at the side, one of which has been removed to provide a place for a steam and hot water boiler for the use of baths, &c., so that only 3 boilers are at present in use, there being but 100 men to provide for. The range has an oven, but only fit for puddings. The boilers in the centre of the kitchen are not in use. The kitchen consumes 1,280 lbs. of coal per week.

### Naval Hospital, Deal.

Occupied as barracks by the 2nd and 7th Foot, 400 men.

Three large square and 1 round boiler, separate fires; a good brick oven, holds six dishes; the full allowance of coals consumed.

### South Barracks, Officers' Mess.

A species of Flavell, without ventilation; it has 3 ovens, and 1 charcoal stove, consumes a very large quantity of coal, and the kitchen very hot.

## V. KITCHENS AT CANTERBURY BARRACKS.

### Permanent Infantry Barracks.

*Kitchen A.*

*Description.*—10 oval boilers in one row.
*Number cooking.*—141 men.
*Boxes of Coals per week.*—15.
*Present State.*—Clean, but badly constructed.
*Remarks.*—One-half bake out of the house, as they cannot make the allowance of coal answer.

[Since altered; Grant's stoves with oven erected, but cannot bake with the allowance of coals.]

*Kitchen B.*

*Description.*—10 oval boilers in one row.
*Number cooking.*—400 men.
*Boxes of Coals per Week.*—40.
*Present State.*—Clean. Doors broken.
*Remarks.*—Obliged to bake for 100 out, as they cannot make the coals last. [Since altered; Captain Grant's stove and oven can bake with 420 lbs. of coals.]

### Line Barracks A.

*Description.*—10 oval boilers in row.
*Number cooking.*—150 men.
*Boxes of Coals per Week.*—15.
*Present State.*—Bad.
*Remarks.*—Two companies are obliged to bake out every day to make the coals last.

### Cavalry Barracks.

*Kitchen A.*

*Description.*—10 small oval boilers.
*Number cooking.*—108 men.
*Boxes of Coals.*—11.
*Present State.*—Badly constructed. Clean.
*Remarks.*—Bake out very often, as the coals will not last the week. [Since altered; Grant's stove and oven cannot bake with the allowance of coals.]

*Kitchen B.*

*Description.*—10 small oval boilers.
*Number cooking.*—84 men.
*Boxes of Coals.*—10.
*Present State.*—Many cannot be used.
*Remarks.*—The same complaint of coals. A very good cook. [Since altered, Grant's stove cannot bake with the allowance of coals.]

### Centre Cavalry Barracks.

*Kitchens A. and B.*

*Description.*—10 small boilers, and 10 very small, which are never used.

*Number cooking.*—122 in each kitchen.
*Boxes of Coals.*—15 each.
*Present State.*—Clean, but inside in a bad state.
*Remarks.*—Very badly constructed, by great management in baking out, can just make the coals last.

### Remarks on Canterbury.

These barracks being a depôt, the number of men is continually varying, and therefore no stove should be erected that could not cook for any number of men, however small. We imagine it is with that view the small boilers, 1 foot long, 10 inches wide, and 1 foot deep, were erected; we think all these boilers might be reset, so as to consume a very small amount of fuel, and to have a separate oven.

## VI. KITCHENS AT DOVER BARRACKS.

### Western Heights.

*Three Kitchens.*

As these are coming down for replacement by Captain Grant's stove, we did not go into the particulars with them.

### South Lines.

*Casemate.*

*Description.*—5 large boilers and 1 oven in guard room.
*Number cooking.*—30 and 39 men;—2 companies of Lancashire militia.
*Boxes of Coals.*—10.
*Present State.*—Boilers good, oven bad.
*Remarks.*—There is room for 200 men, but only cooking places for 100.

### Citadel No. 1.

*Description.*—2 stacks, of 4 boilers each.
*Number cooking.*—57 and 54 men;—2 companies 60th Rifles.
*Boxes of Coals.*—10.
*Present State.*—Ventilation not good.
*Remarks.*—Only boilers enough. The men steam the potatoes by placing some water at the bottom of the boiler, and some bricks with a basket containing the potatoes resting upon them.

### Citadel No. 2.

*Description.*—2 stacks, of 4 boilers each.
*Number cooking.*—50, 49, 48 men;—3 companies 60th Rifles.
*Boxes of Coals.*—15.
*Present State.*—The furnace doors broken.
*Remarks.*—Not sufficient room for the 3 companies, cooking very bad.

### Drop Redoubt.

*Description.*—4 square boilers, and 2 in house adjoining occasionally used for cooking and for washing by the women.
*Number cooking.*—Varies every day from 70 to 150.
*Boxes of Coals.*—The 4 boilers take 9 boxes per week.
*Present State.*—1 boiler cracked, the whole bad and no dampers. The men complain they cannot bake, and have to send into the town. [Since altered and small oven added.]

### Hospital, East and West Wings.

*Description.*—Small range and oven, boiler separate.
*Number cooking.*—Average 50 each.
*Boxes of Coals per Week.*—14 each.
*Present State.*—Clean and like a private house kitchen.
*Remarks.*—The thin tin saucepans render it difficult to make beef tea, rice milk, &c.; the cooks complain.

## VII. BRIGHTON DISTRICT KITCHENS.

### Brighton Barracks.

*Description.*—20 old regulation boilers, placed in the middle of the kitchen round a centre flue, and a new brick three-bushel oven.
*Number cooking.*—263 men.
*Quantity of Coals.*—23 boxes per week.
*Present State.*—Boilers good, furnace doors cracked, very badly set; oven quite new and well built.
*Remarks.*—The oven being new took two boxes of coals to heat it, in a general way it will take 1½ boxes to do so; it will therefore cause more coal to be consumed than the men can afford from their boilers if the boilers are not reset. This could be very easily done without great expense by setting them in pairs, which would save a great space in the kitchen.

*Hospital Kitchen.*

*Description.*—Range with oven and boiler; 2 small boilers 13 inches long, 10 inches wide, and 13 inches deep, with separate fires; one hot water boiler.
*Number cooking.*—53.
*Quantity of Coals.*—Unlimited; the two small boilers take too much.
*Present State.*—Very clean and in good repair.
*Remarks.*—The water is outside of the kitchen not under cover, and all the water has to be brought in with pails for the boiler to supply the baths. [Since supplied in kitchen.]

*Officers' Mess Kitchen.*

The best illustration we have seen of two hot plates, made of the same materials, one being set right, the other wrong. One is in constant use, and the other not used at all; we found out that it had been altered by a cook who had been here.

### Brighton Pavilion Barracks.

*Description.*—7 old regulation boilers and one double oven.
*Number cooking.*—150 men.
*Quantity of Coals.*—12 boxes per week; every 8 men have 84 pounds of coals for kitchen use.
*Present State.*—Boilers good; furnace doors cracked; oven new.
*Remarks.*—The *oven* is of that kind in use in most taverns, club-houses, and large establishments for pastry. It is made in two parts for special purposes; the lower one for those articles requiring a strong heat, and the upper one for light articles of confectionery; this one is strictly a confectionery oven. The makers, Messrs. Packman and Sons, of Brighton, would have made it a *roasting* oven if they had known it was intended for that purpose. The only way to make it so now, and which may be done at the cost of a few shillings, is to place a ventilating brass slide at the top and bottom of the door. These ovens are *exceedingly well* constructed.

As we both have had great experience with these kinds of ovens, we can with confidence speak of their advantages and disadvantages. The greatest disadvantage is that the flue between the two ovens quickly gets choked with soot, and requires great attention. If there is a difficulty in getting that attention where a large staff of servants are employed, how much more so will it with soldiers who do not understand it? Coke is the best fuel to use for it. Its great advantage is the facility of regulating the heat of the top oven—but is that required for soldiers' cookery? It might be employed in hospitals where a permanent cook is employed with advantage, or with some modifications, which we will point out.

If an oven of the size of Captain Grant's, or a little larger than the one at the Wellington Barracks was erected on this plan, or in some situations, like that at Guy's Hospital kitchen, we imagine that it would take less fuel to heat than any other description of

oven, because such ovens are never cold, and when once heated they do not take 10 lbs. of coal to keep at a baking heat.

All ovens where the situation allows of it should be set in brickwork, and that *fire brick*, Stourbridge clay tiles, at the bottom of the oven, and for roasting, well ventilated and open shelves, *not sheet iron*. The whole front being of iron, so that the brickwork is not exposed, is an advantage ; and if the iron front is connected to the back wall by three bolts on each side and two at the top, it would give it a solidity not easily to get out of order. In the oven in question we had not the means of judging of its wear and tear or the state of its flues, it having been used but twice before.

We had four tins of meat, two containing—

9 lbs. of meat, baked in top oven, lost 1 lb. ; and two—

9¾ lbs. „ „ bottom „ 2 lbs.

thus showing, that to obtain sufficient heat in the top oven to bake meat, the heat is too great in the bottom one.

The quantity of coals consumed was about 52 lbs. The ovens would hold 12 tins, or rations for 144 men.

### Shoreham Fort.

*Description.*—2 separate new regulation boilers. Range and boiler, *no* oven.

*Number cooking.*—There are at present 17 men, women, and children ; they do not use the kitchen ; there is room for 48 men and 3 officers.

*Coals.*—Supply unlimited.

*Remarks.*—Water supply very bad. (*See remarks on Eastbourne.*)

### Eastbourne Depôt.

*Hospital.*

*Description.*—Good range, oven and self-supplying boiler ; hot water boiler.

*Number cooking.*—6 ; sufficient for from 20 to 31.

*Coals.*—3½ boxes.

*Remarks.*—Very well adapted for the size. Consumption of coals large.

### Langley Fort.

*Description.*—2 oval old regulation boilers.

*Number cooking.*— There is accommodation for 50 men and 3 officers.

*Coals.*—Boilers not in use.

*Remarks.*—Oven very much wanted as it is so far from the town, and the men have been accustomed to baked meats. The water brackish.

### Eastbourne Redoubt.

*Kitchen No.* 1.

*Description.*—6 boilers, 20 in. long, 16 in. deep, 14 in. wide. 1 double oven the same as at Brighton.

*Number cooking.*—100 men ; it can hold 279.

*Coals.*—Oven 1 box per day ; boilers 1 box per day each.

*Remarks.*—Commence baking at a quarter to ten for half-past twelve ; therefore they bake in a slow oven.

*Kitchen No.* 2.

*Description.*—6 boilers as above.

*Number cooking.*—40 artillerymen.

*Coals.*—These men have in one week had 3 boxes of coals, which have only lasted five days.

*Remarks.*—These boilers, either from their construction or that of the flues, consume more coals than the ordinary ones.

We do not know if the following remarks come within our instructions, but we think it our duty to make them, as they might affect any future alterations that may be made in the cooking apparatus for forts. Both here and at Shoreham, as well as at other forts, there is a great want of fresh water, and where it does exist sometimes brackish, as at Fort Langley.

At Shoreham a tank is being built at great expense, and when done the water in it may become brackish, being below high-water mark.

This might be avoided by having a salt-water distilling apparatus (as on board the navy), either separate or connected with the cooking apparatus. This water is exceedingly good, much more palatable than rain water, and would be useful for all purposes.

### Modification of the Brighton Oven for Hospitals.

The alterations that we could point out in similar ovens to those erected at Brighton and Eastbourne for the use of hospitals would be to make them answer the purpose of oven, hot plate, bain marie, and hot water supply for baths, &c. There is nothing new in the oven, only adaptation, it could be made for cooking by hot water or by steam ; if by hot water, the cistern must be at least 30 feet above the boiler ; if by steam, the boiler may be fed by a small supply cistern and a coil of pipe, conveying steam into the large cistern, as at Shorncliff.

Dampers, &c., are provided so that the boiler would be heated without the oven.

## VIII. REPORT ON CAPTAIN GRANT'S COOKING STOVE.

(*Vide* General Report, fig. 21.)

### 1. St. George's Barracks.

*Result of One Week's Trial.*

*Number cooking.*—On the average 137 men, and boiling on one day for 150 more, and hot water for the house.

*Boxes of Coals per Week.*—28 boxes.

*Present State.*—Quite new, having been little used; the chimney cracked, and should be braced.

*Remarks.*—To light the fire and boil requires 6 lbs. of wood and 60 lbs. of coals.

Nos. 1 and 2 A, boil in 20 minutes.
3 „ „ 30 „
4 „ „ 30 „
5 „ „ 25 „
1 B „ 40 „
2 „ „ 45 „
3 „ „ 50 „
4 „ } never boiled the first day, and
5 „ } could not get them to simmer.

We found that it would not cook well for more than 5 companies, and then requiring a great deal of management.

The oven during the week was not of that heat it should be with such fires ; it would not consume more coal for 5 companies than it did for the 3.

We found the loss of meat in roasting by evaporation was 10 lbs. in 70 lbs., and the meat under-done.

### 2. Captain Grant's Stove.

Artillery Barracks, Woolwich.—No. 1, Right Wing.

*Result of One Week's Inspection.*

*Description of Stove.*—Double row of boilers and one oven. The boilers hold 16 gallons each, and have steamers.

*Number cooking.*—Average 400, in 35 messes, consisting of 18 roast,
8 boil,
4 puddings and pipes,
5 stews, and 490 lbs. of potatoes.

*Boxes of Coals per Week.*—32 boxes.

*Present State.*—Plates cracked, dampers out of order, clean.

*Remarks.*—The oven does not heat properly or regularly ; the meat had to be constantly shifted in it, and it is not large enough for the wishes of the men.

The 2 boilers nearest the oven do not cook, only

make the water warm. There are not enough steamers; some of the potatoes have to be taken up at a quarter-past 11 to make room for others.

The meat is placed in the oven at half-past 9.

Fires banked up all night, and set going at 6.

We consider that it will not cook well for more than 500, and that the fire-place is wrongly constructed.

There are two permanent cooks, and 1 serjeant to the cookhouse. No water in the house, which occasions more wear and tear to the pans.

### 3. Captain Grant's Stove in the Aldershott Kitchens.

North Camp Cook Houses.

| Lines. | Description. | Number of Men cooking. | Boxes of Coal per Week. | Present state. | Remarks. |
|---|---|---|---|---|---|
| A | Capt. Grant's | 367 | 28 | Plates cracked, lids bad. | The ladles are not large enough; they are not used. |
| B | „ | 387 | 36 | Do. very dirty. | No water near it. |
| C | „ | 250 | 24 | Do. clean - | The 36th came from Chichester; like the old boilers best, not being so dirty. |
| D | „ | 300 | 24 | Do. do. - | |
| E | „ | Not in use | — | Very dirty and rusty. | |
| F | „ | 76 | 18 | Clean - - | Only one end used. |
| G | „ | Not in use | — | Very rusty. | |
| H | „ | „ | | „ | |
| I | „ | 90 & 80 | 14 & 7 | Cracked, and boilers broke. | 90 of the 4th and 80 of military train. |
| K | „ | 110 | 10 | Do. and opened. | Only one end used. |
| L | „ | 200 | 24 | | |
| M | „ | Not in use | — | Very dirty. | |
| N | „ | „ | | | |
| O | „ | „ | | | |
| P | „ | „ | | | |
| Q | „ | 225 | 27 | Very clean - | Hospital. — This is one that has been altered by having an oven placed in the middle, and doing away with two boilers. It does not answer, a large fire at each end having to be forced to heat the oven. |
| | | 2,085 | 212 | | |

South Camp Cook Houses.

| Lines. | Description. | Number of Men cooking. | Boxes of Coal per Week. | Present State. | Remarks. |
|---|---|---|---|---|---|
| A | Capt. Grant's | 260 | 25 | Plates cracked, and dirty. | No corporal in charge. |
| B | „ | 320 | 30 | „ | Lids very bad. |
| C | „ | 280 | 25 | „ | Occupied by the West York. Some of the men understand cooking; they complain of the plates not being close together, which lets in the air, and thus requires more coal. |
| D | „ | 218 | 21 | „ | Lids very bad. |
| E | „ | Not in use. | | | |
| F | „ | | | | |
| G | „ | | | | |
| H | „ | 585 | 40 | Cracked, but well kept. | Oxford's; not large enough for the number. |
| I | „ | 90 | 14 | „ | One end only used; not enough coals. |
| K | „ | Not in use. | | | |
| L | „ | | | | |
| M | „ | 260 | 20 | „ clean. | Stafford's; men complain of the dirt; want aprons. |
| N | „ | Not in use | — | Very bad state. | |
| O | „ | | | | |
| P | „ | | | | |
| Q | Capt. Grant's oven. | 410 | 32 | Cracked - | North Devon Rifles. — Double row of boilers with oven recently erected under the superintendence of Capt. Grant; the oven bakes differently at times, depending on the wind, and never well from there being too much steam in it; the ventilator cannot be opened because the soot falls on the meat; they must bake every day to have their rations properly; average 210 in oven, the fire lighted at 6, meat put in about 10 and taken out 10 minutes past 12. Frying pans and a permanent cook. |

Aldershott.—South Camp Cook Houses—*continued.*

| Lines. | Description. | Number of Men cooking. | Boxes of Coal per Week. | Present State. | Remarks. |
|---|---|---|---|---|---|
| R | Capt. Grant's oven. | 218 | 28 | Cracked - | Military train. Not coals enough. |
| S T | „ „ | 710 | 56 | Cracked pans with holes. | 22nd—Just came in from Preston. No corporal in charge. A very large fire made, as the men said, to get the end boilers to boil; no water under the grate. The men do not like them equal to the old boilers at Preston, not knowing how to use them; for the same number at Preston 50 boxes were used. |
| V | „ and drum stove. | 138 | 17 | „ | |
| W | „ | Not in use. | | | |
| X | „ | 237 | 37 | „ | 4th Dragoon Guards. —Complain of dirt. |
| Y | „ | 150 | 15 | Damper bad. | Only one end used. Permanent cook. Royal Artillery. |
| Z | „ | 190 | 17 | „ | Hospital. — Not hot water enough. |
| | | 4,066 | 317 | | |

Permanent Barracks Cook Houses.

| —— | Description. | No. cooking. | Boxes of Coal per Week. | Present State. | Remarks. |
|---|---|---|---|---|---|
| East Block,— | | | | | |
| No. 1 - - | 8 boilers and brick oven. | | | | |
| No. 2 - - | „ „ | | | | |
| No. 3 - - | „ „ | | | | |
| No. 4 - - | „ „ | 130 | 16 | 4 furnace doors broken. | Artillery. Short of coals; ovens only hold six tins. |
| Centre Block,— | | | | | |
| No. 1 - - | „ „ | | | | |
| No. 2 - - | „ „ | | | | |
| No. 3 - - | One of Capt. Grant's, divided in two, and brick oven. | 640 | 70 | Plates cracked. | Erected different from any we have seen, the flues go into the wall, the plates are a brick higher. |
| No. 4 - - | | | | | |
| West Block,— | | | | | |
| No. 1 - - | 8 boilers and brick oven. | 540 | 60 | 7 doors cracked. | |
| No. 2 - - | „ „ | | | | |
| No. 3 - - | „ „ | 70 | 24 | 5 „ | Do not bake. |
| No. 4 - - | „ „ | 62 | 16 | 6 „ | Cooks well, and they like it. |
| Field Battery, Artillery,— | | | | | |
| No. 1 - - | 3 boilers and oven. | 200 | 19 | Very clean and good. | Separate kitchen; should like to give them a careful trial. |
| No. 2 - - | „ „ | 200 | 19 | „ | „ „ „ |
| Hospital - - | Range, oven, and 2 boilers. 3 of Soyer's stoves. | 76 | 15 | - „ - | Permanent cook. Tins bad; complains of rice milk burning. Soyer's stoves not used. |
| „ - - | 1 boiler for hot water. | — | 4 | | |
| Hospital Huts | Range and oven, boiler for hot water. | 130 | 14 | - - | Range made by Halstead, of Chichester; we think there must be some mistake about the coals, but assured the contrary. Bars of range being replaced once in 12 months. Permanent cook. |

Cavalry Barracks not yet given up, should like to try their working, as we think they will prove economical.

### 4. Answers to the Questions relative to Captain Grant's Apparatus.

| Queries. | Answers. |
|---|---|
| 1. How long after lighting the fire does it take to boil one gallon of water? | From 35 to 50 minutes. |
| 2. What weight of fuel is required to boil that quantity? | From 40 to 60 lbs. |

| QUERIES. | ANSWERS. |
|---|---|
| 3. The nature and quality of the fuel ? | Good coal. Turf could be used, or wood. |
| 4. How long does it require to cook (bake, stew, and boil,) the usual rations ? | That entirely depends on the number of rations, the more there are, the greater the allowance of coal, the quicker they are done. The men prefer placing the meat in the boilers at 9, for their dinners at half-past 12. |
| 5. The weight of fuel required to do so ? | That likewise depends upon the number of rations, varying according to the construction of the stove, the class of their skill and practice, and nature of fuel. |
| 6. Is the apparatus simple or complicated ? | It is *simple*, but badly constructed, and might be very much improved. |
| 7. Is it easy to repair ? | The first part that breaks, and generally about one hour after the fire is lighted, are the two front plates; these crack with the report of a gun; it is caused by the expansion and contraction of the iron; these are difficult to repair. The iron covers are too thin, and the furnace door should be differently constructed, that is in 2 pieces, as the bottom breaks away from the top, and is difficult to repair. [Since done.] |
| 8. Is it injurious to the health of the men in working ? | *No*, nor is it injurious to their clothes, if they are not obliged to place their feet on the plates, to remove the boilers, which, however, is frequently done during the day. |
| 9. Does it afford facility in cooking ? | Yes, it permits the operations of frying and stewing, as well as boiling and baking, if properly constructed. |
| | It is the old-fashioned hot plate and oven of hotels and taverns, which it is intended should burn up all the cinders and rubbish of the house ; a good dinner with 12 entrées can be much easier and better cooked by it than by many used for that purpose. |
| 10. Is it applicable to the camp as well as the barracks ? | It is not applicable in the field, not being moveable, but in camps like Aldershott and Shorncliff it is ; it might be made applicable for permanent barracks, if differently constructed. |
| | No. 2. |
| 1. Can the fire be so regulated that any given amount of heat can be obtained for any of the boilers along its course ? | No ; the fire cannot be regulated as they are now constructed with the same quantity of fuel. The three first boilers always boil first, and in many cases the end ones never boil if left in their places. |
| 2. Can boiling and stewing be done in every boiler ? | Not if the boilers remain in their places, but can be if they are shifted about. |
| 3. Can the dinners be so cooked in every boiler that the products shall be equally nutritious ? | Yes ; if the men understand what they are about, but decidedly not if they are ignorant, as we have seen on several occasions. |
| 4. Are there any of the boilers in which the dinners are over cooked or under cooked ? | If the boilers were left in their places, three would be cooked too much, and three raw. The plan adopted is to cook in the three front ones, and when the meat is done to remove it, then thicken the soup, give it a boil, replace the meat, and remove the boilers to the back, bringing the others forward in which they boil or steam potatoes. |
| 5. Are the ovens capable of thoroughly roasting meat ? | As at present constructed, even at Shorncliff, they do not roast well ; to roast at all they require coals for 300 rations, and the fires forced. |
| | There is one very important point against the oven easily altered, which causes the meat to be soddened and not roasted. The men are in the habit of placing water in the pan at the bottom of the oven ; when it is warm the steam arises and cannot escape, as the ventilator which goes into the chimney cannot be opened without causing the soot to fall upon the meat. |
| | The permanent cook in line Q, Aldershott north camp (used as a hospital), stated that he had the greatest difficulty in getting the oven to roast, although the plates had been made shorter by sacrificing two boilers. The ovens will only cook properly with a double row of boilers, ventilator altered, and plenty of coals. |
| 6. On comparing the best results which can be obtained by Captain Grant's apparatus, with the best results that can be obtained with the ordinary barrack boiler, with a separate oven, is there any advantage on either side as to durability, facility for efficient cooking, and economy of fuel ? | The advantage of *durability* is on the side of the barrack boilers, as they cannot be taken out of their places and dropped on the stones or bricks, and the covers cannot be made use of for any other purpose. The iron covers of Grant's stoves are too slight, and the boilers are often used for purposes for which they are not intended. |
| | Captain Grant's gives greater *facility* for cooking, as the operations of frying and steaming can be done with it. |
| | There is no *economy* of fuel with any number under 400 ; above that the economy commences. We think the apparatus might be made much more advantageous if there was a person to superintend who understood it. |
| 7. The same on comparing Captain Grant's oven with an ordinary detached roasting oven ? | Captain Grant's oven being part of the system, and heated by the same fire that boils, would be economical if cooking was done for more than 400 ; but on the other hand, if the number is under 300, then the ordinary detached oven is the most *economical ;* it also gives greater *facility*. |
| 8. Can Captain Grant's apparatus be made available for cooking for a reduced number of men, with a *proportionate* reduction of fuel ? | No, decidedly not in *proportion*. If one end is used for one or two companies, it takes the same amount of coals as would do for 4 companies ; nor can we see well how to remedy this, and we consider it impracticable to cook for a small number on it, with the usual allowance of coal. |

General Remarks.

The apparatus is dirty, resulting from the soot on the boilers which falls on the plates ; the men have

no brushes to remove it. Those that wear aprons dirty them the first day. The cleanest men cannot help being dirty. We consider that the men ought to keep their kitchens as clean with Captain Grant's stove as it is in the hospitals; we invariably find them dirty. The chopping blocks are used for every purpose but what they are intended for; in kitchens having frying-pans there are no hooks to hang them to; the ladles are scattered about, and steamers, when not in use, contain either coals, sand, or potato peels in any corner; the iron meat forks are used to stir the soup, to the injury of the bottom of the pan, while this does not prevent the soup burning.

### 5. Proposed Alterations in Captain Grant's Apparatus.

The alterations which we would suggest in it are but slight; they are,—

*First.*—The ash-pit to be of fire brick, well set in with at least 6 inches of clay, to prevent the water running away, which, in such places as Dover, Shorncliff, and Aldershott, is of great importance.

*Second.*—To lengthen and narrow the fire-place, and to place the bars with an inclination downwards to the furnace door.

*Third.*—To cast the front plate in two pieces. [Since done.]

*Fourth.*—To have a piece of wrought iron ¼ inch thick, 3 inches wide, which should go under the front plates at the joint. [Since done.]

*Fifth.*—The chimneys to be braced with iron just above the oven. [Since done.]

*Sixth.*—The bottom of the damper, between the two end boilers, to work in a hole in a small iron plate fixed in the brickwork; at present it very quickly gets out of order. The damper above the oven, in all cases, should be worked by pullies and with ease, as a great deal depends on its proper management. [Since done.]

In their construction (Dover for example), the engineer should be allowed a discretion to alter the plans to suit the locality. It is doubtful if the flues will draw properly at Dover, from their proximity to the hill, whereas if the flue had been taken under the floor and up into the hill, it would have increased the draught, and at the same time have been more certain of acting well.

*Seventh.*—To carry a bended pipe from the ventilator into the flue, or even outside, to prevent the soot getting into the oven. [Since done.]

The next, in our opinion, is a most important alteration, and is one which Captain Grant may have had some motive which we are not aware of, in not adopting.

It is to bring out the furnace door and top plate level with the front brickwork, and between that door and the place of the present one to place a dead-plate.

The door of the furnace to be made like that on the new oven at the Wellington barracks, or according to Silvester's patent. This would prevent the breakage to the furnace door at the junction between the top and bottom part. The inside of the fire box should be Welsh lumps of the exact size, as no bricks will stand the rough usage of the men.

## IX. REMARKS ON GAS COOKING AS AT PRESENT IN USE IN THE VARIOUS BARRACKS AND HOSPITALS.

| QUERIES. | ANSWERS. |
|---|---|
| 1. How long after the fire is lighted does it take to boil one gallon of water? | That depends on the size of the burner and the thickness of the pan, copper is best to use for the purpose. |
| 2. What weight of fuel is required to boil that quantity? | To boil an iron saucepan with one gallon of water will take 20 feet of gas. |
| 3. The nature and quality of the fuel? | Common gas with jets and nipples. |
| 4. How long does it require to cook, (boil, stew, and boil) the usual rations? | It is the best mode of stewing which exists, the heat can be regulated as required. To boil, it is not economical, and should only be used as an auxiliary for that purpose; it is very good to roast with; with proper ventilation and care, good combustion will be obtained; the time required depends on the thickness of the joint; a ribs of lamb may be roasted in 15 minutes with 15 feet of gas, and be better done than by an open fire. |
| 5. The weight of fuel required to do so? | The quantity of gas depends on the size of the joint, small joints will require but a short time; for pies a small amount of gas with little ventilation; for large joints, a larger flame and more ventilation. |
| 6. Is the apparatus simple or complicated? | Exceedingly simple. |
| 7. Is it easy to repair? | Very easy. |
| 8. Is it injurious to the health of the men? | Not at all injurious. |
| 9. Does it afford facilities in cooking? | Great facilities. |
| 10. Is it applicable to the camp as well as the barrack? | Not at all applicable to the camp. |

### General Remarks.

It is questionable if gas apparatus is applicable for barracks with the existing arrangements for cooking; to roast by it, requires great care on the part of the cook to know the requisite heat, and the time each piece of meat should be placed in the oven. A cook requires teaching to use it. And then the ovens differ either in their construction or pressure of gas. The best gas oven which we have seen is that at Colney Hatch Asylum, erected by their own engineers. They make their own gas at a cost of 1*s.* 3*d.* per 1,000 feet cube. From our own experience we consider gas the cleanest and easiest mode of roasting, and a great auxiliary in every kitchen where a good supply of gas can be obtained.

## X. REPORT ON THE KITCHENS OF METROPOLITAN INSTITUTIONS.

### Newgate Prison.

*Description.*—A large double-case pan, 1 large single ditto, 1 potato steamer, all heated from a 1-horse *round* steam boiler, at 5 *lbs.* pressure.

*Number cooking.*—400.

*Coals.*—About 8 cwt. per week.

*Present State.*—Been erected 20 years; very roughly constructed; new bottom to boiler 7 years since.

*Remarks.*—Construction bad; soup made of 3 oz. of meat with vegetables and groats for 1 pint, very good; 1 pint of oatmeal porridge morning and evening.

### City Prison, Holloway.

*Description.*—4 double-case pans, 2 single ditto for potatoes. Supplied from a four-horse Cornish boiler, worked at 15 *lbs.* *A large steam chest, consumes its own smoke.*

*Number cooking.*—500.
*Coals.*—Unlimited.
*Present State.*—Erected 7 years; no repairs, and in very good state.
*Remarks.*—Meat boiled in 8 to 10 lbs. to pieces. All boiled, no roast. Soup made from 3 oz. of meat, 1 oz. pearl barley, 1 oz. onions, better than any soup made by the soldiers, with ¾ lb. of meat.

### Reformatory in the Euston Road.

*Description.*—Apparatus erected by Captain Grant, similar in description to those in use at Aldershott, only the middle is divided by a wall, thus one part is in the kitchen and the other in the laundry, the oven is in the kitchen, and the fire of the laundry is sufficient to heat it. The laundry is at work every day, and all day: thus the consumption of coal in the kitchen part is small. This as fixed could only be used in certain places, the heat it gives in the kitchen is very great, without any corresponding advantage. *A large iron oven* set in brick: oven in 4 pieces, set on hot plate. The *hot plate of no use*, and the back of oven *too hot* for rotary shelves, and will *never do for bread, and for meat will require great care.*

### St. Bartholomew's Hospital.

*Description.*—Two gas ovens 5 feet high, 3 feet wide, set in wall with moveable side plates. Plate with 3 gas burners, rings, and separate taps, 1 large double-case pan and 2 smaller ditto, heated by steam from a four-horse boiler at 4 lbs. pressure.
*Number cooking.*—A large range for roasting. From 800 to 1,000.
*Coals and Gas.*—Average 3 cwt. per day, and 500 feet of gas per day.
*Present State.*—Good.
*Remarks.*—Nipples in the gas pipes bad. Supply of steam very complete and very well arranged.

### Guildhall, City.

*Description.*—3 large gas ovens 8 feet long, 7 feet high, and 2 feet deep. One has a double row of pipes and doors. Two hot closets with pipes with jets. Plate or stones, 12 single taps, square tubes, steam boiler for boiling.
*Number cooking.*—From 1,500 to 1,600.
*Gas consumed.*—The 3 ovens would consume 2,400 feet per hour.
*Present State.*—Been erected 2 years, and only used once a year.
*Remarks.*—Easily removable.

### Fever Hospital, Liverpool Road.

*Description.*—A common range with oven, hot plate and boiler, at the side 2 copper boilers and hot water plate with separate fires, fastened with screws; a potato steamer separate.
*Number cooking.*—Made to cook for 200.
*Coals.*—Unlimited.
*Present State.*—Very bad. The *coppers contain copperas* in them every morning. They should be so constructed as to be easily removed to be re-tinned.
*Remarks.*—It could never cook for 200.

### Small Pox Hospital, Highgate.

*Description.*—Small range *with steam boilers* and wide oven; 2 *steam kettles.*
*Number cooking.*—80.
*Coals.*—Unlimited.
*State.*—Very good and clean.
*Remarks.*—A hot plate wanted or gas; floor asphalted, which is bad.

### Warburton's Asylum.

Three iron boilers, direct fire oven; remarkable for the *copper tea and coffee kettles.*

### Middlesex Hospital.

*Description.*—2 double and 2 single pans, of 80 gallons each, supplied from two 8-horse *waggon-headed boilers* at 15 lbs.
*Number cooking.*—100 to 200.
*Coals.*—2½ *tons per week.* Supplies hot water.
*Present State.*—Very good.
*Remarks.*—Badly constructed.

### St. George's Hospital.

*Description.*—2 single and 2 double case pans of 50 gallons each, heated from small waggon boiler well set; range with oven; gas oven not used, but *gas used as an auxiliary for boiling; old separate oven not used.*
*Number cooking.*—50 to 200.
*Coals.*—2 cwt. per day.
*Present State.*—Good except the gas stove.
*Remarks.*—Well worthy of imitation in all hospital kitchens; the steam could be made use of instead of the gas.

### Foundling Hospital.

*Description.*—3 double case pans, and 2 copper pans, old; 5 Count Romford's ovens set in the original way, out of order and cannot judge of the quantity of fuel; the pans supplied from 2 large Cornish boilers with steam chests.
*Number cooking.*—300.
*Coals.*—8 cwt. per day.
*Present State.*—Not well fitted up; old coppers very properly not used.
*Remarks.*—Count Romford's ovens being in their original state, and this the only place in London where they are, are curious; the brickwork seems to give way very much.

### Female Orphan Asylum.

*Description.*—2 double pans, steam from range, gas oven with nipples.
*Number cooking.*—150.
*Coals and Gas.*—No particular quantity, and no meter to tell the gas.

### Guy's Hospital.

*Description.*—3 double and 1 single 88-gallon pans, supplied from a Cornish boiler 150 yards away, worked at 15 lbs. pressure.
*A very good oven, set in brickwork, never cold.* A small range. Fish and chops cooked in the wards.
*Number cooking.*—Average 300; can cook for 400.
*Coals.*—The waste steam is supposed to be enough for the kitchen.
*Present State.*—Built in 1725; very good.
*Remarks.*—The boilers are *5 feet diameter, and do the work* of all the establishment: supply hot water, heat the rooms, and the laboratory. *Buckingham's composition is used;* and the *condensed steam is used* in the *laboratory* for medical purposes. It has been *analyzed*, and found to be pure. The composition is supposed to go into the *encrustations:* they are blown off every 28 days.

### St. Thomas's Hospital.

*Description.*—2 large double case pans, 80 gallons each, 2 of 25 gallons. *Worked from boiler behind range.*
Separate oven 2 feet six inches wide, 3 feet high, and 2 feet 6 inches deep. Built 13 years and works well.
*Number cooking.*—460.
*Coals.*—Unlimited.
*Present State.*—Good.
*Remarks.*—The boiler behind *range* obliges the fire to be lighted, and consumes a *large amount* of coal when the range is not required. A *separate boiler would be cheaper.*

*Laooratory.*

A locomotive boiler, worked at 30 lbs. pressure, does work equal to cooking *for* 1,000 *men.* About 4 *sacks of coke per day.*

CHRIST'S HOSPITAL.

*Description.*—Six of *Count Romford's ovens*, with fire to each.

A very large double case boiler, and a smaller one, and two single copper pans, heated by steam from a steam boiler of 6-horse power, worked at 5 lbs. One single pan by direct fire in case of accident to the boiler.

*Number cooking.*—Average 1,000.

*Coals.*—Each *oven* takes 84 *lbs.* for each baking. The consumption in the kitchen is 80 tons per annum.

*Present State.*—Very good, except the *copper boilers*, which are to be *removed* and replaced with iron ones, in consequence of requiring so often *re-tinning*, and difficulty of *cleaning*.

*Remarks.*—The ovens are well constructed, but too far apart.

Steam boiler worked by the cook.

Arrangements for sending away good.

BLIND SCHOOL.

*Description.*—1 roasting grate, not used for cooking; 2 iron boilers; 3 hot plates; and 2 *ovens, an improvement of Count Romford's;* it roasts the meat remarkably well.

*Number cooking.*—184.

*Coals.*—240 lbs. per day.

*Present State.*—A pattern for all institutions.

*Remarks.*—The oven made by Jeakes. Only 1 cook and 1 kitchen-maid employed.

ORPHAN ASYLUM.

*Description.*—3 double case pans, and to use with direct steam; 2 *pudding steamers, good*, supplied from a large Cornish boiler; 4 *Count Romford's ovens, never used;* 1 *large* 14 *bushel oven used instead. Bakes only meat for dinner.*

*Number cooking.*—410.

*Coals.*—1 cwt. per day for oven; for boiler not known.

*Present State.*—Good.

*Remarks.—The reason the iron ovens were not used, is that the flues require constant cleaning, and it dirties the cooks' aprons.*

The diet table is worthy of notice:—

Sunday.—Cold roast beef.
Monday.—Roast beef.
Tuesday.—Boiled pork.
Wednesday.—Boiled beef.
Thursday.—Baked plum pudding.
Friday.—Roast mutton.
Saturday.—Beef puddings or hash.

The dinners three days in the week take about $\frac{1}{4}$ *lb. of coals per head*, and it is supposed that the boiling by steam takes the same; this is the smallest amount of coal we have heard of (if correct).

COLNEY HATCH ASYLUM.

*Description.*—2 large kitchens alike, containing 3 large double case pans, 2 smaller ones, and 3 large single pans for potatoes, heated by steam; *all raised* 18 *inches* from the floor. A large double case pan in centre of another part of the kitchen, heated by steam, for hot water for the tea, a very excellent arrangement; 2 double case pans, not raised, for cocoa; a very large *gas oven in* 6 *compartments, well built and arranged, capable of holding half a ton of meat, heated by jets, outside of doors covered with mahogany.* Another gas oven to hold 144 large pies; this is a failure as it is at present; very easily altered.

*Number cooking.*—1,500 in each kitchen.

*Coals and Steam.*—Waste steam for boilers; the large oven consumes about 1,000 feet of gas in two hours, which is all the time allowed for roasting.

*Present State.*—Quite new, and the *best kitchen we have seen, and worthy of imitation. The steam boilers are the safest and best we have seen.*

STRANGERS' HOME, POPLAR.

*Description.*—A modern Kitchener 10 feet wide, 2 feet deep, with boiler and oven, fire very deep; *burns coke*, and draught regulated by dampers; *cost* 100*l.*

*Number cooking.*—130.

*Coals.*—3 *bushels of coke* per day.

*Present State.*—Been erected about two years; it has had no repairs, but seems to burn the sides.

*Remarks.*—Nothing but stews; ovens not often used. *Its iron stewpans are different from any we have seen.*

CONSUMPTION HOSPITAL.

4 double and 3 single case pans, never used; a large waggon boiler used once a week; hot plate, range and oven, sufficient for 200, cooks only for 46.

INNS OF COURT.

*Lincoln's Inn.*

*Description.*—A very large roasting range 12 feet long, 4 feet high, horizontal bars; smoke-jack working both ends; spits 1 inch thick; consumes for roasting 6 *cwt. of coals*, and employs two cooks. Two good hot plates; scullery with boilers for potatoes and vegetables.

*Number cooking.*—300.

*Coals.*—12 cwt. per day.

*Present State.*—Good.

*Remarks.*—Before the fire were 5 spits, 12 legs of mutton on each spit, 16 saddles of mutton on each, 6 large ribs of beef, and poultry, altogether 36 legs and 16 saddles of mutton, 6 ribs of beef, and 12 fowls, employing two cooks, and *consuming* 6 *cwt. of coals; gas to cook the same would cost* 8*s., but leaves clean dripping. By this plan no dripping is left*, all being burnt and black. It is only used during four months in the year.

*Temple Kitchen.*

*Description.*—Roasting range, brick ovens, hot plates, and charcoal stoves; scullery in kitchen built in 1731.

*Number cooking.*—Numbers vary from 60 to 150.

*Coals.*—Half a ton per day.

*State.*—Good but old fashioned.

*Remarks.—Brick oven not liked by the cooks;* better hot plates required.

*Middle Temple Kitchen.*

*Description.*—Roasting range with *perpendicular bars*, hot plates, and iron ovens; steam boilers, waggon-headed, 4-horse 5 lbs.; warms hall.

*Number cooking.*—From 50 to 150.

*Coals.*—Unlimited.

*State.*—Been built 21 years; in very good repair.

*Remarks.*—No gas used in any of the above.

CITY OF LONDON UNION.

*Description.*—2 large double pans and 2 large single pans, 4 feet diameter, 2 feet 6 inches deep, 4 small double case, 2 ft. by 1 ft., 2 feet 6 inches deep, 6 small double case boilers moveable for teas and broth, in a very bad state, made of copper; the above are heated from a 40 horse-power Cornish boiler (Bolton and Watts), with large steam chest situated 100 feet from the kitchen; steam pudding case not used.

*Number cooking.*—900.

*Coals.*—The boiler does the work for all the house, therefore it is impossible to know.

*Present State.*—Been up 8 years, in very good repair.

*Remarks.*—The boiler works up to 15 *lbs.*, the heat is regulated by the taps, and from the great distance of the kitchen, it must lose a great portion of its heat. *There is great condensation and no use made of the water.* The boiler is *kept free* from incrustation by *Buckingham's composition.* The pans take half an hour to boil.

### Westminster Union.

*Description.*—2 large pans double case worked with 2 round 2-horse boilers, worked to 5 lbs.
*Coals.*—1½ *tons per week.*
*Present State.*—Boilers badly set.
*Remarks.*—*Baking done out of the house.*

### St. Martin's in the Fields.

*Description.*—A large Kitchener with 2 ovens ; 2 old copper boilers ; 1 iron boiler separate for potatoes.
*Number cooking.*—200.
*Coals.*—Unlimited.
*Present State.*—*The coppers in a very bad state, the food liable to be poisoned every day.*

### St. Luke's Union.

*Description.*—3 double and 1 single case pans, heated from Cornish boilers of 4 horse, worked at 25 lbs., *the extra heat from furnace heats circulating hot water boilers, which supply baths, laundry, &c.*
*Number cooking.*—300.
*Coals.*—4 to 5 cwt. per day.
*Present State.*—New.
*Remarks.*—Made by Fraser, of Limehouse ; arrangement good, but badly placed.

### Holborn Union.

*Description.*—3 iron pans, of 150, 100, and 70 gallons respectively ; 1 double case pan for tea, supplied with steam from one 2-horse Cornish boiler.
*Number cooking.*—600 to 700.
*Coals.*—3 cwt. per day, which includes circulating hot water boiler.
*Present State.*—Very bad.
*Remarks.*—Bake bread in house, but give no baked meat. *Cooking very indifferent in consequence of direct steam.*

### Clerkenwell Union.

*Description.*—4 double case pans of 80 gallons each, heated by steam from large Cornish boiler.
*Number cooking.*—500.
*Coals.*—5 tons per week, including for hot water.
*Present State.*—Bad, and badly fitted up.
*Remarks.*—*Good things badly fitted up.*

### West London.

*Description.*—4 iron pans ; direct fire.
*Number cooking.*—400.
*Coals.*—24 cwt. per week.
*Present State.*—Bad.
*Remarks.*—Old fashioned, about to be removed.

### Islington Union.

*Description.*—3 large iron boilers, containing 100 gallons, 90 gallons, and 50 gallons ; heated by direct fire ; a small range.
*Number cooking.*—400.
*Coals.*—2 *tons per week,* or 630 lbs. per day.
*Present State.*—Very bad.
*Remarks.*—*Boilers always cracking.*

### St. Pancras Union.

*Description.*—4 double case pans, 3 single pans, holding 150 gallons each ; heated with Cornish boiler, at 30 lbs. pressure. *The surplus steam only used for cooking.*
*Number cooking.*—1,450.
*Coals.*—*For three 20-horse boilers,* 1 *ton per day.*
*Present State.*—Very good, except the *steam escapes, which are useless,* and had better be removed.
*Remarks.*—The boilers work steam engine for pump and laundry ; do the laundry work, baths, &c. ; house in excellent condition; meat good, but very badly cooked.

### Chelsea Union.

*Description.*—3 double and 1 single case pans, set away from wall, heated by a *boiler of novel construction,* made by Burridge and Healey ; 2 pans, direct fire in case of accident.
*Number cooking.*—500.
*Coals.*—15 *cwt. of coals* per week.
*Remarks.*—*The boiler seems to consume a small quantity of fuel ; the steam escapes are novel.*

### Marylebone Workhouse.

*Description.*—2 large boilers, 170 and 160 gallons ; 2 small boilers, 50 and 30 gallons ; 2 small boilers for potatoes, with steamers ; 2 brick ovens, *all direct fire.*
*Number cooking.*—1,000.
*Coals.*—Not known.
*Present State.*—Bad.
*Remarks.*—Is about to be altered ; bake for outdoor relief ; *machine for bread ; 50 per cent. bone in the mutton from its original weight, thus,* 8 *oz. meat when raw make* 4 *oz. when cooked.*

### Bethnal Green Union.

*Description.*—4 double case pans, 2 single pans, 3 feet long, 2 feet wide, and 3 feet deep ; 3 small pans for beef tea, supplied with steam from a locomotive boiler, which also supplies a double case cistern on top of house, 2 feet square, and 2 feet deep for hot water, and 1 copper and 25 troughs in laundry.
*Number cooking.*—900.
*Coals.*—4 sacks of coke per day.
*Present State.*—Good, all but the steam escapes ; better without.
*Remarks.*—*Locomotive boilers good ;* the *consumption of fuel very small ; there are two, one large, and one small in case of accident ;* they are made by Barrow, of New Cross ; the tubes *are lap welded,* and the boilers are *blown out every two weeks,* or the encrustation would get thick at the welding, and then it would give way ; about 6 pails full of condensed water every day.
The *pans are covered with felt.*

### Lambeth Workhouse.

*Description.*—2 pans heated from steamer at *back of range ;* 4 ovens in bakehouse; *bread-making machine.*
*Number cooking.*—400.
*Coals.*—No account ; ovens 160 lbs. each for 5 batches, or 60 lbs. for 1 batch.
*Present State.*—Not large enough for the house.
*Remarks.*—*Yeast made at home,* good ; *tins for puddings good,* and should be copied.

### St. George's, Hanover Square, Union.

*Description.*—3 double case and 2 single pans heated by 12-horse Cornish boiler, at 15 lbs. ; *gas stove by Berry ; 3 ovens and* 11 *stoves,* not in use, no gas.
*Number cooking.*—300 to 400.
*Coals.*—3 cwt. per day.
*Present State.*—Good, all but gas.
*Remarks.*—*Scullery well fitted up, and worthy of imitation* in clubs, hotels, &c., &c. ; *pans lined with zinc, and heated by coils.*

### East London Union.

*Description.*—4 large *single case* pans, heated by 2 waggon boilers, worked at 5 lbs. ; *hot water boiler between the two heated from their fires.*

*Number cooking.*—About 200.

*Coals.*—Would not say, as the consumption is large.

*Present State.*—Good.

*Remarks.*—The *hot water boiler* is bad, as it *requires the two boilers* to be lighted. Direct steam in pans at 5 lbs. pressure; bad. *Iron potato holder*, 8 made *to fit each pan.* The boilers heat the chapel.

### Whitechapel Union.

*Description.*—3 pans or boilers, direct fire, hold 50, 80, and 100 gallons each; small range, and boiler for hot water.

*Number cooking.*—600.

*Coals.*—1 *ton per day.*

*Present State.*—Very old and bad.

*Remarks.*—The arrangements and food seem to be very bad.

### Strand Union.

*Description.*—3 copper pans, 70, 75, and 87 gallons each, supplied with steam from a 14-*gallon round boiler*, worked at about 4 lbs. 2 *Lismore pans* for potatoes.

*Number cooking.*—200.

*Coals.*—120 lbs. per day.

*Present State.*—*Very bad, copper pans disgraceful*; the food must be spoiled by them.

*Remarks.*—*Small boiler to do the work.*

### Hackney Union.

*Description.*—5 single pans, 80 gallons, with worms, *no steam escape*, supplied with steam from 2 small waggon boilers at a low pressure; 1 large brick oven.

*Number cooking.*—600.

*Coals.*—3 cwt. per day for boilers, 1 *cwt. for oven.*

*Present State.*—Good.

*Remarks.*—*Pans with coils. Potatoes steamed in galvanized iron baskets placed inside of pans 5 inches square and 24 inches deep.* Boilers supply hot water. Bridge very deep. Oven bakes 52 *sacks of flour per week.*

### General Remarks.

In the foregoing it is worthy of remark that the cooking is mostly performed by steam, the exceptions being those that have been erected many years. It is curious to notice the variation in the quantity of coal consumed, varying from $\frac{1}{4}$ lb. to $\frac{3}{4}$ lb. per head per day.

The wear and tear of steam boilers is, perhaps, equal to that of the pans with direct fire, but the food is better prepared, not being burnt. Great economy is also effected by supplying the establishments with hot water and heat in conjunction with the cooking apparatus.

In some cases the brick ovens have replaced the iron ones, being more economical, that is, where large numbers are provided for.

The whole is worthy of consideration in fitting up barrack hospitals.

## XI. RESUMÉ OF REPORTS UP TO MARCH 31, 1859.

### Resumé of our Reports.

The various apparatus inspected are :—

No. 1. Captain Grant's with and without ovens.
No. 2. Flavell's kitcheners.
No. 3. Steam at Shorncliff Hospital.
No. 4. Soyer's stoves.
No. 5. Cottager's stoves.
No. 6. Sadlier's ovens.
No. 7. Stoves erected by Mr. Elliott, which are Captain Lemprier's.
No. 8. Mr. Mennie's stove at Woolwich.
No. 9. New stove at Buckingham Palace barracks.
No. 10. The hot plate and ovens at Kensington barracks.
No. 11. The old regulation boilers of all sizes, set in all ways.
No. 12. The same according to the new plan.
No. 13. Gas cooking apparatus.
No. 14. Brick ovens of all sizes.
No. 15. The new iron ovens.

Upon many of these we have made a special report, and the conclusions we have arrived at are as follows :—

No. 1. Grant's stove. An old plan in use many years since in taverns; one very similar to it in size with two ovens and rings to suit all sized stock pots was placed in the middle of the kitchen at the City of London Tavern, Bishopsgate Street; they have all made way for modern improvements. The moveable boilers are and can be made use of for other purposes. The soot on the boilers in moving renders it exceedingly dirty, the plates and furnace doors are liable to damage, and there is no economy when in use for less than 400 men, and there is no possibility of cooking effectually for more than 600.

No. 2. Flavell's kitchener, when erected for a private house, with two ovens and a hot water boiler, and under proper control, is a useful apparatus; but if there are more ovens added to it on either side it is liable to get out of order, and not economical. We do not consider it adapted for soldiers' use.

No. 3. Steam cooking at Shorncliff Hospital is exceedingly good and economical, and well adapted for the purpose intended, but the apparatus is too large for hospitals containing a small number of patients; for any number *above* 200 it is the most *economical* of all *systems* in boiling. We wish to call your attention to the reports on the various kitchens of the institutions of this metropolis, which accompany this, and more particularly to the new one at Colney Hatch Asylum, it being the best we have seen. The boiler is one that we recommend to be used in all large kitchens, being *economical, simple, and safe.* Next to this are the boilers at the Bethnal Green Union and the laboratory at St. Thomas's Hospital; after these in comparative economy in use are the Cornish and waggon-headed boilers. We likewise would call your attention to the addenda on Shorncliff Hospital accompanying this,—a plan which we would recommend to all hospitals using steam.

It is found to be the most economical system by all large institutions having a fixed number of inmates, but we doubt if steam could be used with economy in barracks under the present arrangements. If used at all it can only be in depôt barracks or in the Wellington, where the steam boilers are under the control of the engineer.

No. 4. Soyer's stoves are very excellent auxiliaries in temporary barracks, and are the best we have hitherto seen for out-door use. The economy of fuel is very great, and the plan of the firebox and doors is exceedingly good. The firebox, casing, and flue are altogether too slight for permanent use.

No. 5. Cottagers' stoves. These are too slight for barrack use, become soon destroyed, and consume a large amount of fuel.

No. 6. Sadlier's ovens, see "Report on Shorncliff." These are useful as field ovens. They are made on the old Belgian plan, will burn any kind of fuel, and a small quantity heats them.

No. 7. Stoves erected by Mr. Elliott at Shorncliff, known as Captain Lemprier's. The large one is too complicated, and in use too dirty. The boilers being moveable are bad, and the ovens low, become dirty; the small ones are good, and might be further improved by imitating the club-house hot plates.

No. 8. Mr. Mennie's stove at Academy, Woolwich. A good roasting fire, with 2 good ovens for pastry, not adapted for barrack or hospital use, being too large.

No. 9. New stove at Buckingham Palace barrack. A very good stove for a small number, but not adapted for the place it is in; we doubt if it will be able to remain through the summer without great alteration in ventilation.

No. 10. Hot plate and ovens at Kensington barracks are good, in a large kitchen with plenty of ventilation, and when a permanent cook is employed not adapted for the place they are in.

No. 11. The old regulation boilers of various sizes and shapes, and set in all manner of ways, either against the wall, or in stacks in the middle of the kitchen; they possess the advantage of being fixed, and are exceedingly simple, and cannot be inadvertently damaged; as they have been hitherto set, it has been without any regard to economy. *We believe the experiments now going on by your orders will render them economical in use. We recommend that they should be erected in the middle of the kitchen, as at Walmer, Chatham, &c., and raised two steps, like Colney Hatch.* We beg to call your attention to the plan for erecting single boilers; also to the addenda for Canterbury for setting nine boilers with one fire; also to the Report on the Regent's Park barracks, as well as that on Chatham, all of which would greatly economise fuel. In respect to those boilers which possess steam escapes, we have endeavoured to find out the origin of their application; we find them in general use in all large establishments, originally employed without any intention of cookery. We have come to the conclusion that they are not only superfluous, but detrimental to the cookery, for the soldier requires the liquor with his meat as a soup, and the only way to obtain that good is by the usual and proper mode of cookery, quiet simmering and not a hard boil; by the former all the aroma and flavour of the meat, vegetables, &c. is retained in the liquor; and by the latter all are dispersed in the form of steam or gas. To illustrate what we state we would refer you to page 69 of Soyer's Shilling Cookery Book.

No. 12. The old regulation boiler, according to the new plan at the Wellington barracks. The experiments are not sufficiently advanced to give any opinion.

No. 13. Gas cooking apparatus. We beg to refer to our report; according to the present barrack arrangements this apparatus is not fit for soldiers' use.

No. 14. Brick ovens. Their construction, &c., are well known. Large ones in large barracks, with a baker in charge, we approve of; but small ones, as in the new cavalry barracks at Aldershott, we consider useless. The men will not be able to use them with their allowance of fuel.

No. 15. The new iron ovens we consider the best and most economical ovens for small numbers that we have seen in use. We believe that they would hold one half more meat and bake with the same quantity of fuel, but if they are kept at the present size the furnaces should be so constructed that no more fuel should be used than is required. We think that the fire tile under the bottom, as at Regent's Park barrack, will be liable to crack. The expansion and contraction of the iron and fire tile being different, we think that a stouter piece of iron and fire tile at the bottom, like that at Brighton, would be an improvement. Sand is often used for the purpose, but it is the remains of an old system in use before we had the excellent fire tile we now have.

Having given our opinions upon the various apparatus, we beg further to add that all the care and trouble that may be given to them in order to promote the health and comfort of the soldier, as well as to effect economy in fuel, will be perfectly useless unless each kitchen is placed under *proper control, and the person in charge should understand the nature of the apparatus he superintends. Our reports, more especially that on the gas stove, will have shown this.*

We have also remarked the great ignorance of the men even in the rudest system of cookery, and the very great waste of food consequent thereon. If any plan could be adopted by which a few men could learn and teach others, good cooking would quickly spread, for nothing is learnt so quickly as that which gratifies the animal senses; it would also render men more serviceable in emergencies.

The adoption of wire baskets instead of nets for potatoes, 4 or 6 according to the size of the boiler, being made to fit it, would prevent a very great waste with potatoes.

We think it would be useless to adopt any apparatus for the use of any other kind of fuel but coal, as we find, after repeated trials, that in a general way there would be no economy with coke, and with regard to turf there are but six or seven barracks in Ireland that use it, the price of coals being low, viz.:—

| | s. | d. | | s. | d. | |
|---|---|---|---|---|---|---|
| Dublin prices 1856 | 14 | 6 | Belfast | 1 | 0 | per ton more. |
| 1857 | 13 | 6 | | | | |
| 1858 | 14 | 0 | Cork | 1 | 6 | ,, |
| 1859 | 12 | 5 | Limerick | 2 | 0 | ,, |

The use of wood is quite out of the question in Great Britain.

We believe a fuel might be made, such as is in use by the soldiers in Belgium and parts of Prussia, which would effect economy and prevent peculation.

There is another matter,—we do not know if it comes within our instructions, but as it may have a great effect upon cooking apparatus, we beg to mention it,—it is this, that if there is the smallest injury to any part of the apparatus, even a screw out of a hinge, a report has to be made through three or four different parties before it can be repaired, and by the time it is ordered other injuries occur for the want of the screw. If the barrack master had the power to direct either the armourer or farrier to repair such small accidents, it would often prove a very great saving; this we find does not occur in camps, as the engineers are continually inspecting, and send a man immediately to repair.

## XII. REPORT OF TRIALS MADE WITH MESSRS. BENHAM AND SONS' COOKING APPARATUS IN No. 6 COOK HOUSE, WOOLWICH GARRISON. [*Vide* General Report, Fig. 59.]

This apparatus being erected on a very novel plan has required a long series of trials in order to properly test its efficacy. During the early part of the trials it was under the direction and control of Messrs. Benham's foreman; it is only during the last three weeks that it has been under the complete control of the men, by which a fair estimate may be made in regard to its future working; these trials are appended to this report.

The apparatus consists of a steam boiler, hot plate, and brick oven, the oven being in the centre, the boiler over the oven door, and the hot plate round the sides of the oven. The steamers are separate, and in another part of the kitchen.

*The result of the various trials will be best understood by the answers to the following questions:—*

| QUERIES. | ANSWERS. |
|---|---|
| 1. How long after lighting the fire does it take to boil one gallon of water? | The boiler being self-feeding and containing upwards of 80 gallons, it is never empty, never gets cold; it boils within 45 minutes after the fire is lighted. |
| 2. What weight of fuel is required to boil that quantity? | To boil it when full rarely exceeds 40 lbs., but varies according to the wind; when boiling a very small quantity keeps it so. |
| 3. The nature and quality of the fuel? | Any kind of coal or cinders. |

| QUERIES. | ANSWERS. |
|---|---|
| 4. How long does it require to cook (bake, stew, and boil) the usual rations ? | The construction and work done on the hot plate entirely depends on the upright flue ; what is good here might in another place be bad. During its construction it had to be altered several times ; the heat at present is the same all over it, the stewpan at the greatest distance from the fire boiling as well as the nearest, it is used for stewing and boiling.<br>The time it takes to steam the vegetables and pudding depends on the quantity and size,—about one hour. This is the most defective part of the apparatus (see General Remarks).<br>The time required for the full bake, that is meat and potatoes, is $2\frac{1}{2}$ hours. Bread can be baked in it as well as in the best baker's ovens, and in the usual time (see General Remarks). |
| 5. The weight of fuel required to do so ? | The apparatus has been constructed for 500 men ; it requires more fuel in proportion to cook for 50.<br>To boil for breakfast, dinner, and tea,—<br>for 50 - 70 lbs.<br>150 - 100 „<br>from 500 to 700 - 130 „<br>1,000 - 260 „<br>To bake for messes of—<br>12 under 240 - 50 lbs.<br>25 „ 500 - 80 „<br>In the last trial, June 2nd, in cooking for 708, boil, bake, and stew, and 1 bushel of bread, with the oven heated after the meat was taken out, it took 160 lbs. |
| 6. Is the apparatus simple or complicated ? | It is rather complicated, but not more than persons of the most ordinary attainments can easily understand ; for men quite ignorant of cooking it is easier than the common boiler. |
| 7. Is it easy to repair ? | We consider it very easy to repair, but beg to refer to general remarks on its wear and tear. |
| 8. Is it injurious to the health of the men in working ? | It is the coolest cooking apparatus we have ever seen, and by no means injurious to the men. |
| 9. Does it afford facility in cooking ? | For artillery, marines, and cavalry it is remarkably well adapted in giving great facilities to the men in the artillery and marines, who mess in general in 12 and 8, the horse artillery and cavalry in 25's, and who prepare their dinner in their own rooms. The stewpans and steamers are taken up into their rooms in the morning, the dinners are placed in them, and the No. marked on the side, and brought down to the master cook (there is one for 6 rooms), who attends and sees that they are properly cooked ; at half-past 12 the *room cook* comes for them, they are delivered to him, and all is done with the greatest order and regularity as if sending up the largest dinner in the best regulated tavern or nobleman's establishment. |
| 10. Is it applicable to the camp as well as the barrack ? | With some modifications it would be well adapted for the camp. |

G. Warriner.
A. A. Guerrier.

### General Remarks.

The result of our trials involves two questions,—which is best for cooking, brick or iron ovens ? and whether steam can be used in the army for the purpose of cooking ?

In regard to the first question it must be ascertained which cooks the best ; which is the most serviceable ; which consumes the smallest amount of fuel ; and which has the least wear and tear ?

In comparing the results of Benham's oven with the best results of iron ovens, there is no doubt but this has the advantage, not only in the manner in which meat is cooked, but in the amount of nourishment left in the meat when cooked, for being erected on the roasting plan, having two outlets to let off the steam, renders the meat much more palatable. Several bakers and oven builders have stated that in consequence of those outlets the oven would not bake bread ; we have therefore made two trials, the results of which show us that it will bake bread in a very superior manner, much better than many ovens erected expressly for that purpose.

We can with confidence state that the baking of the meat is perfect ; it is the best roasting brick oven we have ever seen, the heat is admirably regulated. All the men state that they have never had such meat before, little thinking that it is the oven which makes the difference.

In regard to its being serviceable, that depends on the number it has to cook for. We think that for a small number up to 200, iron ovens are the most serviceable, as they are the quickest heated, and many stews and various kinds of cookery can be done in them, that cannot be done in brick ovens.

In the consumption of fuel, if the oven is taken with the rest of the apparatus, there is no doubt but that it is the *most economical that has ever yet been invented and used ;* but if the oven is taken alone, then the iron oven set on good plans has a slight advantage, those at Knightsbridge barracks consuming 2 oz. of coals per head, that at the Wellington $2\frac{86}{200}$ oz. per head, the brick one in question consuming $2\frac{1}{2}$ oz. per head ; but if the apparatus is used for all purposes it will be seen, in referring to the trials, that it cooked for 708 men with $3\frac{1}{2}$ oz. of coal per head, which also includes 2 quarts of boiling water per head.

The question of wear and tear is one which can only be arrived at after some experience, this being the first oven erected on this plan ; but from very minute inquiries amongst bakers we find that a brick oven which we have seen has been in constant use for more than 50 years, and kept in repair at an expense of 4*l.* per annum.

The iron ovens which we find to have been the longest up are those at the Foundling Hospital, erected in 1780 ; there are some in Dublin of the same date. Those at the Foundling Hospital are kept in repair at an expense of 6*l.* per annum.

Those of the Duke of York School at Chelsea require renewing once in four years. The brickwork in the other part of the apparatus will not be so durable, resulting from the alterations it has undergone during its erection ; it should all have been encased in iron, and the top covered with the same material or with slate, so that it should be kept clean, and less liable to damage.

The next question is,—Can steam be used in the army for the purpose of cookery ? It seems to excite great doubt amongst many connected with the service. In the present instance it is more the shape

of the boiler and the manner in which it is supplied with water, that causes fear of its being dangerous; it is equally as safe as the old open boilers or those on Captain Grant's stove which steams potatoes, it being in fact all but open, the steam only being retained by a syphon pipe 3 inches in diameter, so that no accident can happen.

Steam is used in all workhouses, prisons, and public institutions, and often under the control of the inmates, who are not supposed to be possessed of any particular knowledge relating to it.

There is also not a doubt but that steam is the cheapest medium of cooking, and I think it may safely be introduced into use by the army, at any rate by branches of the service that possess more intelligence than others. If once introduced, there is a wide field open for improvement, and this very apparatus with slight modifications might be made to consume 25 per cent. less fuel, in fact bringing it down to the standard required by Count Romford, of $\frac{1}{15}$th part of the weight of food.

It has great advantage in regard to hot water for breakfast and tea, &c. as well as for household use, being a self-feeding supply and obtainable from a tap, is preferable to any that has hitherto been in existence in the army. The teas and coffee are far superior in strength and flavour than by the present system of boilers.

Its durability depends greatly on the quality of water used and the deposit it forms; the water here, like most of the Kentish waters, contains a large amount of lime, and will occasion the boiler to be frequently blown off in order to loosen the deposit; the men seem to be capable of doing this with ease.

A boiler of this thickness in regular use, the same as in this kitchen, will last from 10 to 12 years without repair, the pipes being simply constructed will last the same period. The brick-work of the furnace, &c. will require more repair.

The modifications that we would suggest in the erection of another apparatus similar to this, would be as follows:—

In the first place the kitchen is too small, it is not near large enough for the comfortable working of the apparatus.

The oven door should be in the usual way and height from the floor, a descent of two steps to the bakehouse and an ascent of two steps to the cook-house, a rail dividing them, the baker alone attending to the fire; this would do away with one very serious objection.

The apparatus should have but one fire for boiler, hot-plate and oven, and consume its smoke, this would save 25 per cent. of fuel *and is easily effected.*

The boiler should be tubular, by which a larger amount of steam would be obtained, and the pipes conveying the steam should run along the flue of the hot-plate to the pans at the back; the syphon should go into the ash-pit.

The steamers should be four square pans, each holding 9 square baskets of iron, like those now getting into general use in the unions since the commencement of our labours. The hot-plate should be differently constructed, and with either smaller stew-pans for artillery service, or larger for infantry, and stronger materials. A tell-tale should indicate the state of the water in the cistern.

For 500 men the oven should be larger.

The top of boiler, supply pipe, steam-pipe, should be cased in and out of sight, the whistle only to be heard.

The tap for hot water should be convenient to the door.

We must here remark that certain rules and regulations ought to be observed in the service with regard to kitchens in general and this one in particular, which should be signed by the commanding officer and placed in the kitchen. This would avoid disputes with the men. For example, a troop is ordered on parade, the cook with them, shortly after the dinner; they return at half-past four, the cook goes to the kitchen and there is no hot water, on some days it is locked up at that hour and the corporal in charge gone; the orderly officer on going his rounds finds the troop without tea, he goes to the cook-house, and finding no fire, immediately orders the man in charge under arrest. This might be avoided and a great saving effected to the service by a system of regularity which most especially ought to be observed in the army.

In this kitchen, where there is but one boiler for hot water, and to keep that boiling at a late hour is attended with expense; a rule similar to the following should be adopted:—

| | *h.* *m.* | *h.* *m.* |
|---|---|---|
| Hot water for breakfast | 7 0 | to 7 45 |
| „ cleaning | 9 0 | „ 11 0 |
| „ „ | 12 30 | „ 1 30 |
| „ tea | 2 30 | „ 3 0 |

Water between or after those hours to be boiled on the hot-plate in the pans. All bakings to be in the kitchen by 9 o'clock.

STATEMENT of TRIALS made with Messrs BENHAM & SONS COOKING APPARARUS in No. 6 Cook-house, Woolwich Garrison.

| Date. | No. of Ration. | Bakes. | Soup. | Stew. | Puddings. | Sea Pies. | Frys. | Potatoes, lbs. | Green Rations. | Gallons of Water. | Coals, lbs. | Time Fire lighted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | A.M. |
| May 2 | 50 | — | — | 50 | — | — | — | — | — | 50 | 60 | 6.0 |
| „ 3 | 50 | 50 | — | — | — | — | — | — | — | 50 | 140 | 6.0 |
| „ 4 | 150 | 96 | — | 54 | — | — | — | 60 | — | 100 | 142 | 6.0 |
| „ 5 | 490 | 241 | — | 220 | — | 17 | 12 | 125 | — | 200 | 260 | 6.30 |
| „ 6 | 1,026 | 451 | — | 675 | — | — | — | 630 | — | 600 | 370 | 6.0 |
| „ 7 | 560 | 300 | — | 260 | — | — | — | 300 | — | 400 | 260 | 6.30 |
| „ 8 | 569 | 288 | — | 281 | — | — | — | 300 | — | 350 | 260 | 6.45 |
| „ 9 | 640 | 312 | — | 328 | — | — | — | 340 | — | 300 | 260 | 6.30 |
| „ 10 | 680 | 300 | — | 308 | 12 | 36 | 24 | 360 | 36 | 300 | 260 | 6.30 |
| „ 11 | 690 | 312 | 12 | 320 | 12 | 10 | 24 | 300 | 48 | 360 | 260 | 6.30 |
| „ 12 | 701 | 312 | — | 389 | — | — | — | 320 | 12 | 400 | 260 | 6.0 |
| „ 13 | 703 | 300 | — | 403 | — | — | — | 360 | 12 | 400 | 260 | 6.0 |
| „ 14 | 712 | 312 | — | 300 | — | — | — | 300 | — | 300 | 260 | 6.0 |
| „ 15 | 708 | *420 | — | 240 | 12 | 36 | — | 260 | 60 | 300 | 260 | 6.0 |
| „ 16 | 702 | 360 | — | 402 | — | — | — | 300 | 48 | 350 | 260 | 6.0 |
| „ 17 | 689 | 288 | — | 301 | — | — | — | 324 | — | 350 | 260 | 6.0 |
| „ 18 | 670 | 300 | — | 300 | 24 | 36 | — | 360 | — | 350 | 260 | 6.0 |
| „ 19 | 662 | 312 | — | 324 | — | — | 26 | 340 | — | 350 | 260 | 6.0 |
| „ 20 | 630 | 288 | — | 442 | — | — | — | 400 | — | 400 | 260 | 6.0 |
| „ 21 | 602 | 324 | — | 242 | 12 | 12 | 12 | 360 | 24 | 400 | 255 | 6.0 |
| „ 22 | 594 | 336 | — | 198 | 12 | 24 | 24 | 240 | 36 | 300 | 250 | 6.15 |
| „ 23 | 560 | 300 | — | 224 | — | 36 | — | 300 | — | 400 | 240 | 6.0 |
| „ 24 | 666 | 324 | — | 306 | — | 24 | 12 | 360 | 36 | 400 | 240 | 6.0 |
| „ 25 | 648 | 360 | — | 240 | — | 36 | 12 | 300 | 12 | 450 | 240 | 6.0 |
| „ †26 | 524 | 324 | — | 128 | 8 | 48 | 12 | 220 | — | 350 | 220 | 6.0 |
| „ 27 | 620 | 348 | — | 272 | — | — | — | 280 | — | 500 | 200 | 6.0 |
| „ 28 | 650 | 336 | — | 314 | — | — | — | 300 | — | 500 | 200 | 6.0 |
| „ 29 | 692 | 360 | — | 260 | 24 | 48 | — | 310 | — | 300 | 180 | 6.15 |
| „ 30 | 720 | 360 | — | 348 | 12 | — | — | 320 | 12 | 350 | 180 | 6.0 |
| „ 31 | 703 | 348 | — | 331 | — | 24 | — | 300 | 24 | 350 | 180 | 6.0 |
| June 1 | 706 | 360 | — | 330 | — | 16 | — | 290 | 36 | 500 | 160 | 6.0 |
| „ ‡2 | 708 | 300 | — | 384 | — | 12 | 12 | 350 | 36 | 350 | 160 | 6.0 |

* May 15; 96 of these were fruit pies.
† May 26; on this day there were baked in the oven, after the meat, four bushels of bread.
‡ June 2; on this day there were baked in the oven, after the meat, one bushel of bread.
The plan of working is as follows:—Fire lighted at 6.0; hot water for breakfast in three-quarters of an hour. Oven lighted at 7.45; meat put in at 9.30; stews put on at 10.0; steam turned on at 11.0; meat turned in oven at 11.0; meat taken out of oven, stews, &c., vegetables served at 12.30; hot water for washing up from 12.30 until 1.30; hot water for teas from 2.30 to 3.30; hot water in any quantity for washing up after that hour.

## XIII. REPORT ON MR. RADLEY'S COOKING APPARATUS ERECTED IN No. 3 COOK HOUSE, WOOLWICH ARTILLERY BARRACKS. (Vide General Report, Fig. 60.)

| QUERIES. | ANSWERS. |
|---|---|
| 1. How long after lighting the fire does it take to boil one gallon of water? | About 30 minutes. |
| 2. What weight of fuel is required to boil that quantity? | About 30 lbs. |
| 3. The nature and quality of the fuel? | A good coal. |

| QUERIES. | ANSWERS. |
|---|---|
| 4. How long does it require to cook, boil, stew, and bake the usual rations ? | The ovens do not bake well, as will be seen from the result of the trials. It stews or boils for 24 rooms on the hot plate very well; it will only steam one pan or 100 rations of potatoes, which it does in 45 minutes. |
| 5. The weight of fuel required to do so ? | For 50 - - 120 lbs.<br>100 - - 160 „<br>200 - - 160 „<br>It would not consume more if the whole quantity of rations were being cooked. |
| 6. Is the apparatus simple or complicated ? | It is simple, and many like it are in use in hotels, taverns, and hospitals. One very much like it is in use at the St. Martin's-in-the-Fields Workhouse. |
| 7. Is it easy to repair ? | Not as at present constructed, but could easily be made so. |
| 8. Is it injurious to the men in working ? | No ; the doors in front of the fire prevent the bad consequences of Flavell's kitchener. |
| 9. Does it afford facilities in cooking ? | Yes, to a service like the Foot Artillery, who cook in messes of 12. |
| 10. Is it applicable to the camp as well as the barracks ? | It is not applicable to the camp. |

### Description of the Apparatus.

It is a stove greatly resembling Flavell's kitchener, except that the front is enclosed with doors.

The ovens contain a rack and cradle to hold the meat, with the axle passing through the door, to be turned on the outside. This, however well it might be for Infantry Barracks, is not adapted for the Artillery ; therefore Mr. Radley has done away with it and substituted shelves. The grate is also made to move up and down, which, in our opinion, is useless for the soldiers.

There are seven various sized soup kettles to cover the hot plate ; these might be used by Infantry, but are not adapted for the Artillery use ; Mr. Radley has therefore added 24 stew pans. The soup kettles boil the water for breakfast, tea, and washing up. The boiler holds 11 gallons of water, intended to steam 4 single pans and 1 double pan ; we find that the boiler will only give steam for 2 pans. The apparatus is similar to what is in use in many large vessels in the navy ; it might be made to cook for 500 to 600 persons, with 160 lbs. to 200 lbs. of coals, but it requires the following alterations :—

The boiler to be larger, so as to give hot water in the morning and steam for the pans. The hot plate to be lowered to within three inches of the top of the oven ; the sides of the grate to fit close to the oven; at present there is a space of 6 inches. The grate to have stronger bars and a wider space between them. The fastenings of the oven to be altered. The application of steam to the pans to be improved ; and the taps for condensed steam removed and another system adopted. With these alterations it will answer the purpose intended.

### Account of Trials with Radley's Cooking Apparatus.

*July* 11.—Cooking for 55 men.

Lighted the fire at ¼ to 8 ; water boiled in 30 minutes. Put the meat in oven at ¼ past 9. Shifted the meat at 11 ; at ½ past 12 one mess done. At 1 took them out ; none well done. Plenty of hot water ; consumed 120 lbs. coals.

*July* 12.—Cooking for 120 men.

Fire lighted at ½ past 6 ; at 7 plenty of hot water ; at ¼ to 9 placed in the ovens ; bakes for 10 rooms, one Irish stew and one steamer of potatoes. The half bakes stew and potatoes, well done ; the full bakes underdone and coddled. Consumed 160 lbs. coals.

*July* 13.—Cooking for 200 men.

Fire lighted at 6 ; hot water at 7 ; 8 full bake, 4 half ditto ; 4 pies, 1 stew, 5 puddings, and 1 steamer of potatoes. All well done except the full bakes, which were underdone and coddled. Consumed 160 lbs. of coals.

## XIV. REPORT ON THE IRON OVEN AND FLANGE BOILERS ERECTED AT THE WELLINGTON BARRACKS, ST. JAMES'S PARK. (*Erected from instructions of the Commission for improving Barracks and Hospitals : for latest form vide General Report, figs.* 56, 57, 58.)

This oven, as will be seen by the sketch, is 3 feet 10 inches wide, 1 foot 9 inches high, and 2 feet deep, with two doors made of iron and set in brickwork, with furnace under it 7 inches by 7 inches ; and ash-pit without a door, and two side holes to admit air through a series of pipes at the sides of the furnace in order to create a draught, and carry the heat and flame up the sides of the oven, and at the same time assist in the consumption of the smoke ; it has also a wrought iron boiler at the back, 2 feet 6 inches wide, 2 feet high, and 9 inches deep, with a supply cistern. It consumes, on an average, 35 lbs. of coal to bake for 200 men. The meat is well done and with ease, and those who use it like it.

It is clean in its use, and can, with proper instructions, be used by the most ignorant person, a point of very great consideration, if the men are to be taken daily or weekly from the ranks to act as cooks, without any previous instruction.

In my former report I stated that the bottom of the oven in Wellington Barracks would quickly burn out,—such proved to be the case ; within four weeks after it was erected it had to be replaced. This was caused by two circumstances—the bottom of the oven being too close to the furnace, and a larger fire being made than was required for it, in order to heat a boiler at the back : this has not been the case with the other ovens erected on the same plan without the boiler, and whose bottom is not so low.

The bottom of this oven has now been repaired six weeks ; it is half an inch thicker than the first, and it shows very little alteration ; but there is no doubt but that in a short time it will begin to draw down similar to the former ; no iron can get red-hot every day without doing so.

To remedy this, two plans must be adopted : first, to lower the fire-grate at least two inches, and have an ashpit door to stop the draught ; the ashpit to hold water ; and the furnace should not exceed seven inches in width.

There should be printed instructions placed in the kitchen informing the men, in case the bottom gets red hot, to shut the ashpit and furnace doors, and not to keep them open ; this would soon damp the fire, and prevent the bad effects of the atmosphere on the surface of the heated iron when the furnace door is thrown open, which they invariably do.

The men are quite aware that when the bottom is red hot it does not bake so well. In one of the ovens at Knightsbridge Barracks, on seeing some bricks at the bottom of the oven, I asked the man why they were there ; he observed that it got so soon red hot and burnt the meat. On my asking him why he put so much coal on, he answered, "He *put none at all*, "for it got red hot before he was aware of it." This is the same oven which I tried ; in baking for 50 men it consumed 7 lbs. of coals. On going to the opposite kitchen in the same barracks, and mentioning the circumstance to the men there, they immediately stated that the man forced his fire ; they never got theirs red hot, as the bottom dishes would spoil if

they did, but it required great care; they bake every day, and their average consumption of coal is 80 lbs. per week, about 2 oz. of coal per head.

The man at the Magazine Barrack (with a similar oven) never allows the bottom to get red hot, but it requires great care to prevent it.

The two at Hampton Court are always red hot, as the fires are forced, in consequence of the short time the men have to cook their dinner, resulting from the nature of their drill.

In the Albany Barracks, Regent's Park, in which are now eight companies of the 2nd Life Guards, who have permanent cooks, and some of the best I have yet seen in the service, and whose cooking would not do discredit to any gentleman's establishment, there is an oven similar to the one at the Wellington Barracks. But although there is an extra plate screwed on the bottom of this oven, the men have great difficulty in keeping down the heat. They are obliged to place sand on the bottom, and raise the lower shelf one inch (it is blistered up in the inside). These men, like those of the Wellington Barracks, complain of the want of ventilation in the oven. They are accustomed to place a large quantity of water in the pans when baking, which gives off a large amount of steam, which cannot easily be got rid of, and soddens the meat on the upper shelf.

The men are in the habit of cooking raised and French pies, fruit pies, with puff paste, puddings, &c., and they know the use of brick ovens; they prefer this to the brick oven, being more convenient. They bake every day, and consume during the week 160 lbs. of coals, or $1\frac{3}{4}$ oz. per head per diem.

In regard to their durability, I think these ovens will not prove so durable as those of Count Romford, the heat seeming to have great effect on the cast iron front, and many parts are cracked.

The boiler at the back of the oven is badly set, or otherwise some hot water ought to be obtained from it; but I do not consider the plan good, to have a boiler at the back of the oven, for no hot water is required when the oven is heated, and the fire would have to be forced to heat the boiler, to the detriment of the oven.

If a *corrugated wrought iron* bottom, with a curve of 2 inches to the centre, was used, and sand placed over it, and a sheet of iron to form the bottom of the inside of the oven, there would be no more coals consumed, and the oven would be more durable. This system of using corrugating iron, when it comes in direct contact with the fire, is now getting greatly into use in Yorkshire and Lancashire.

### *Flange Boilers.*

Having noticed the extraordinary results of the flange boilers and their small consumption of fuel, it has led me to obtain particulars of flange boilers, in regard to the durability of those that have been in use in various parts of England.

The result of my inquiries is that flange boilers, if properly set, and with moderate care, last as long as the ordinary boilers. They are principally used with shallow pans, for evaporation, and with sugar boilers, oil refiners, &c. Some that were sent to the island of Jamaica upwards of 20 years since, for sugar evaporation, are as perfect as on the day they were first erected.

In my former report upon the Wellington Barracks I mentioned that, in consequence of the expansion and contraction of the iron when cold water was admitted into the boiler, the flange would be likely to break from it, as the flange itself would seldom be cold. What I then stated shortly proved to be correct, and the flanges on both sides broke. These boilers were afterwards replaced by two others, having, by the direction of Captain D. Galton, flanges with slots cast in them of a quarter of an inch in width. These have now been in use for some time, and no accident has hitherto occurred to them.

But in order to arrive at more positive results, and to try experiments with greater ease than I could do in a crowded kitchen, I had three boilers (one oval and two round) cast with different flanges, in order to ascertain the best kind of flange to adopt. Each of these held six gallons. One round one had a flange with half-inch holes to every square inch of surface; it was cast with very great uniformity of thickness in the metal, a point much overlooked in boiler casting; this was set over a furnace similar to one in Soyer's stoves. On the first time of using, and after the fire had been removed, the water taken out, and cold water placed in, the boiler cracked all round on a level with the flange.

The next round boiler was made with a kind of round fire-box under it, with an opening of 3 inches by $1\frac{1}{2}$ inches, to allow the smoke and heat to pass out and round the boiler. This, after being in use for 14 days, and showing the advantages of flange boilers properly constructed, had the fire-box broken away from it; therefore the advantages derived from it no longer existed.

The oval boiler was cast with three lumps projecting into the fire, somewhat similar to the old-fashioned pots with three legs. This also cracked the first time cold water was admitted into it, after the fire had been withdrawn some time.

All these boilers heated very quick. The six gallons of water boiled in 15 minutes, varying but a minute or two in each. That with the fire-box cast in it took $4\frac{1}{2}$ lbs. coals, that with the lumps 5 lbs., that with the flange 6 lbs.

I mention this in order to show how much superior the double boilers with the flanges, as erected at the Wellington Barracks, are over the single ones with the flanges. After a series of very careful trials, I find that they will boil six gallons of water in each, that is 12 *gallons in* 18 *minutes, with* 7 *lbs. coals;* double boilers, not flanged, take 20 *lbs. coals and* 30 *minutes* to boil *six gallons* of water in each; and single boilers, set in the old way, without flanges, take 12 *lbs.* coals for *six gallons*, and boil in 35 *minutes.*

The next point to be considered was the latent heat retained in the water after the fire had been removed; this is important as regards breakfast and tea.

I find that for the first five minutes after the fire has been removed very little heat is lost; after that it loses 5° of heat every five minutes, or it may be taken on an average of 1° per minute. This, of course, is with water; with soup it would not be so quick, depending on its thickness. The boilers without flanges I found to lose 10° every five minutes, or just double the amount.

The result which I arrive at is, that there is a great saving of fuel with flange boilers set double, and 1 steamer for 2 boilers, and made on the plan of those in the Wellington Barracks, so that there is sufficient hot water for all domestic purposes after the potatoes are cooked.

That the saving of fuel is still greater with the ashpit door, but the ashpit ought to be made so as to contain water, which would cause the fire bars to last longer and prevent clinkers; this ought to be done in all future cases; if a plan could be devised to add a damper, so as to take the great heat off one boiler and throw it upon the other, it would be a great improvement.

The steamer for potatoes for infantry barracks should be 3 inches higher than those at present in use.

If the slotted flange is the best, and by the trials I have made and the opinion of engineers, it appears to be so, then there might be other forms of slotted flanges better that the one now in use; for instance, corrugated with slots, so as to prevent the flame and heat passing too quickly over the surface. One of these I am having cast in order to try it, but there are no doubt other forms that might be suggested by persons conversant with the subject, that would be worthy of trial.

I believe that common boilers might be set double with much greater economy than at present. It is

recognized by all architects and builders that no two men set a boiler alike; if some positive rule for setting double boilers was once adopted, and that setting made in solid fire clay, so that the bricklayer could make no mistake, then the large number of boilers now in use in Great Britain and the Colonies might, when the occasion presented itself, be reset according to the plan adopted; this would effect a great saving.

June 6, 1859. G. WARRINER.

*Further Report on improved Boilers at Wellington Barracks.*

In obedience to the instructions contained in your letter, I beg to inform you that I have made a careful trial of the several boilers in Wellington Barracks mentioned therein, and also of another set of boilers and oven in the same cook-house. The following is a list of them :—

No. 1. A pair of old regulation boilers set double, with Captain Galton's 2nd smoke consuming furnace, 7 in. wide.

No 2. A pair of slotted flange boilers, set double, with Captain Galton's 2nd furnace, 5 in.

No. 3. One old boiler set on the old plan.

No. 4. A pair of old regulation boilers, set double, in Welsh lumps, with Captain Galton's 1st furnace.

No. 5. An oven with Captain Galton's furnace, of the same construction as furnaces Nos. 1 and 2.

As the trials vary but little, I have not given an account of each, but only the general results, which are as follows :—

No. 1 are two of the regulation boilers erected in brickwork, with iron front and top, and one smoke-consuming grate, and made from suggestions by Captain Galton ; the grate is 20 inches long and 7 inches wide, and formed in the shape of an inverted V.

These boilers, since they have been erected, have been used for breakfast and tea only; they are capable of containing 24 gallons each, but only 18 gallons are placed in each. They boil within 30 minutes after the fire is lighted, and consume 30 lbs. of coals in the process. Ten pounds more are required to keep their contents boiling for two hours. After the fire is removed the water loses 15 degrees of heat in 10 minutes, and 30 degrees in 17 minutes.

No. 2. A pair of slotted flange boilers, with one furnace like No. 1, only the sides of the cast-iron bridges are 5 inches apart instead of 7 inches; and the draught space is 2 inches instead of 3 inches. These boilers are the same as those already reported upon, with the old furnace. The new furnace has been added, and now they boil unequally, the one nearest the window and to the flue boils the quickest. They take 20 lbs. of coal to boil 18 gallons in each in 30 minutes, and 5 lbs. more to cook for 2 hours. The latent heat is given in the former report ; there is a loss of heat in the 18 gallons of 1 deg. per minute since the alteration. The one nearest the window does not lose its heat so quickly.

No. 3 is an old boiler reset, in the very best way, by one of the best workmen, who did all he knew to make it answer, as he is prejudiced against the double ones. To boil 18 gallons of water with this boiler takes 35 minutes, with 30 lbs. coals ; and 10 lbs. more are required to keep it boiling for 2 hours. After the fire is removed it loses 3 degs. per minute.

No. 4. Two old regulation boilers set in brickwork, but resting on Welsh lumps 9½ inches from the top flange ; the furnace between them is 8 inches wide and 21 deep, and has air tubes on each side. The first trial was made with a space of only ⅛ of an inch between the furnace bars. To boil 18 gallons of water it took 18 lbs. of coals and 1¾ hours to do it, and 5 lbs. more to boil for 2 hours longer. The bars were then altered to ⅜ of an inch space, and the boilers boiled 18 gallons of water in each, with 15 lbs. coals, in 45 minutes, and it took 5 lbs. of coal to keep them boiling for 2½ hours.

On the third trial these boilers boiled the same quantity of water in 35 minutes with 15 lbs. coal and 5 lbs. to keep it boiling.

On the fourth trial it took 30 minutes, and 12 lbs. coals, and 5 lbs. addition.

The fifth trial took 25 minutes, with 12 lbs. and 5 lbs. addition.

The men now use these instead of the flange boilers, as they boil the quickest, and the fire is soon lighted.

No. 5. An oven similar to one already reported upon, except that it is higher ; the furnace is of the same construction as that of the boiler No. 1 in this report, with air holes on each side, but only 16 inches deep.

The fire is lighted at ¼ past 8, the meat is placed in the oven at ¼ to 9, by 10 o'clock the temperature has reached 420 degrees, and it then mounts up to 500 degrees if not damped. To bring it to baking heat takes 20 lbs. of coals. To keep it at that heat until 12 o'clock takes 20 lbs. more coals ; its average consumption being 40 lbs., 10 lbs. more than it should be, in consequence of the construction of the flues. The oven might be 2 feet wider and yet not consume more coals. The bridges and top should be made of corrugated cast-iron, and the front should take off with ease, so as to replace the bridge when burnt away ; it would prevent the bottom of the oven burning away, and the meat would be better done, having a more even heat. The handle of the damper should be made longer to get at it with more ease.

TABLE showing the COMPARATIVE CONSUMPTION of COAL in the various BOILERS in this REPORT.

| No. | Description. | Contents. | Time in boiling. | Weight of Food. | Quantity of Coal. | Loss of Heat. | Quantity of Coal per Head. | Quantity of Coal per Head if the Boiler was full. |
|---|---|---|---|---|---|---|---|---|
| | | | Minutes. | | | | lbs. oz. | oz. |
| 1 | 2 Regulation Boilers with Capt. Galton's 2nd Furnace. | 36 gallons, will hold 48 gallons. | 30 | 37½lbs. meat, 50lbs. potatoes. | 30 lbs. to boil, 10 lbs. to keep boiling. | 15 degs. in 10 minutes. | 0 12⅘ | 4½ |
| 2 | 2 Flange Boilers with Capt. Galton's 2nd Furnace. | Do. | 30 | Do. | 20 lbs. to boil, 5 lbs. to keep boiling. | 1 deg. per minute. | 0 8 | 2 1/12 |
| 3 | 1 Boiler on the old plan. | 18 gallons, will hold 24 gallons. | 35 | 37½lbs. meat only. | 30 lbs. to boil, 10 lbs. to keep boiling. | 3 degs. per minute. | 1 10 | 9 |
| 4 | 2 Regulation Boilers with Capt. Galton's 1st Furnace and Welsh lumps. | 36 gallons, will hold 48 gallons. | 25 | 37½lbs. meat, 50lbs. potatoes. | 12 lbs. to boil, 10 lbs. to keep boiling. | 1 deg. in 5 minutes. | 0 5⅗ | 1⅘ |

The custom in the Wellington Barracks is to cook by companies of 50. These boilers hold 24 gallons, and are large enough for 144 men, worked in the following way,—one boiler for breakfast, tea, and hot water, with steamer for potatoes; one boiler for soup.

Since the introduction of the ovens, two companies use the boilers, thus :—The fire is lighted under two

boilers, which answer for two companies. As soon as the breakfast is over the fire is removed and placed under the boilers for the potatoes ; the water in which the potatoes are boiled is afterwards used in washing plates. If hot water is required for the barracks two other boilers are lighted. For tea, the two first boilers are lighted ; as soon as the water boils, the fire is removed, and the tea put in, which is about half past 2 o'clock.

This is the most economical way they have of using the boilers, but it will be seen that the boilers are too large. If they held 10 gallons each instead of 24, it would be sufficient for all infantry barracks as the messes are at present constituted. They would consume less coals, as there would be a much smaller surface to heat, and the men would like them better.

It will appear by the table annexed that the boilers set in Welsh lumps consume the least coal, and retain heat the longest. It also appears that the smoke consuming furnace, without proper management of the damper, consumes more coals, and does not give the same advantages as regards time ; but if the damper could be well regulated, then it shows all its advantages. Too large a quantity of coal should not be put on, and proper directions for its use should be printed and posted in the kitchen ; but as I have said in my former reports, that as soon as a man gets to understand how to use an apparatus he is removed and replaced by another man, who, not knowing how to use it, almost destroys it. This I have seen several times, and I am quite certain that all the labour at present bestowed on the subject will be entirely thrown away, unless some other system, with regard to cooks, is adopted. I am not alone in this opinion ; all the barrack-masters, quarter-masters, and the men themselves agree with me.

The boilers with the Welsh lumps having proved to be so good, I would suggest that two be tried with Captain Galton's 2nd furnace, but with an alteration of the damper. I beg to remark that all the flues are badly constructed.

I have, &c.
G. WARRINER.

## XV.—TABLE OF THE DAILY CONSUMPTION OF COALS PER HEAD IN THE DIFFERENT COOK-HOUSES AND KITCHENS DESCRIBED IN THIS REPORT.

| Kitchens. | Number of Men cooking. | Daily Amount of Coal consumed per Man. |
|---|---|---|
| St George's Barracks - | 305 | All gas, equal to 5 lbs. of coal. |
| St. John's Wood „ - - | 188 | Coal and gas equal to 3lbs. of coal. |
| Tower of London „ - - | 557 | Coal and gas equal to 2lbs. of coal. |
| „ Artillery „ - - | 31 | 2lb. 1oz. |
| Hyde Park Magazine Barracks | 47 | 1 11 |
| Knightsbridge Barracks, No. 1. | 73 | 2 4 |
| „ „ 2. | 60 | 1 13½ |
| „ „ 3. | 60 | 1 13½ |
| „ „ 4. | 70 | 2 7 |
| Knightsbridge Barracks, new roasting oven. | — | 0 2 |
| Kensington Barracks, Cavalry | 48 | 1 7⅓ |
| „ Infantry | 100 | 1 4 |
| Regent's Park Barracks - | 120 | 1 14⅓ |
| Regent's Park Barracks, new roasting oven. | — | 0 1¾ |
| Buckingham Palace Barracks - | 37 | 2 7 |
| Portman - - - | 300 | 1 2¼ |
| Horse Guards, Cavalry - | 50 | 1 lb. 3 oz. |
| „ Infantry - | 50 | 1 3 |
| Wellington Barracks, No. 1. - | 577 | 1 6 |
| „ „ 2. - | — | Gas and coke equal to 1 lb. 0 oz. |
| Duke of York's School - | 500 | 0lb. 13oz. |
| „ Hospital - | 60 | Unlimited. |
| Chelsea „ - | 470 | Unlimited. |
| CHATHAM. | | |
| Fort Pitt Hospital - | 500 | Coal and gas equal to 11lb. 10 ozs. of coal. |
| Garrison „ - - | 300 | Coal and gas equal to 2lbs. of coal. |
| Brompton „ - - | 80 | Coal and gas equal to 5lbs. 11⅓ ozs. of coal. |
| Melville „ - - | 230 | 1 lb. 4 oz. |
| St. Mary's Invalid Depôt - | 400 | 1 0 |
| Chatham Barracks, No. 1. - | 300 | 1 2 |
| „ „ 2. - | 670 | 0 11 |
| „ „ 3. - | 329 | 1 2 |
| „ „ 4. - | 300 | 1 2 |
| „ Bake-house | — | 0 2½ |
| Brompton Barracks, No. 1. - | 254 | 1 2½ |
| „ „ 2. - | 36 | 1 9 |
| „ „ L. - | 73 | 2 13¼ |
| „ „ D. - | 113 | 1 0 |
| „ „ North Square | — | 0 6 |
| „ „ Huts, No. 1. | 121 | 0 15 |
| „ „ „ 2. | 174 | 1 0½ |
| Chatham Marine Cook-house - | 730 | 1 12 |
| „ Bake-house - | — | 0 3 |
| Woolwich Hospital - - | 450 | 0 6 |
| „ Sappers' Huts - | 60 | 2 0 |
| „ Marine Barracks - | 520 | 1 2 |
| „ „ Hospital - | 300 | 0 12⅘ |
| „ Huts, No. 1. - | 87 | 1 12 |
| „ „ 2. - | 300 | 0 14 |
| „ „ 3. - | 200 | 1 0 |
| „ „ 4. - | 300 | 0 15 |
| „ Artillery Barracks, No. 3. | 1,200 | 0 8½ (All these bake out four times a week.) |
| „ „ 5. | 600 | 1 1 |
| „ „ 7. | 750 | 0 7⅓ |
| „ „ 8. | 500 | 0 8¾ |
| „ „ 10. | 400 | 1 2¼ |
| „ „ Benham's apparatus. | 708 | 0 3½ |
| Shorncliff Hospital - - | 200 | 1 12 |
| Hythe Barrack - - | 240 | 1 2½ |
| Walmer Barrack, South - | 232 | 0 6 |
| „ „ North - | 350 | 1 4 |
| „ Hospital - - | 100 | 1 13 |
| „ Naval Hospital - | 400 | 1 4 |
| Canterbury Barracks,— | | |
| Permanent Infantry, A. - | 141 | 1 3⅓ |
| „ „ B. - | 400 | 1 2¼ |
| „ Line, A. - | 150 | 1 4 |
| „ Cavalry, A. - | 108 | 1 2¾ |
| „ „ B. - | 84 | 1 4 |
| „ CentreCavalry | 122 | 1 5⅓ |
| Dover Barracks, Casemate - | 69 | 1 10¼ |
| „ Citadel, No. 1. - - | 111 | 1 4¾ |
| „ „ 2. - - | 147 | 1 2⅔ |
| „ Drop Redoubt - - | 150 | 1 4 |
| „ Hospital - - | 100 | 3 3 |
| Brighton Barracks - - | 263 | 1 0 |
| „ Hospital - | 53 | Unlimited. |
| „ Pavilion - | 150 | 1 8 |
| Shoreham Fort - - | 17 | Unlimited. |

| Kitchens. | Number of Men cooking. | Daily Amount of Coal consumed per Man. |
|---|---|---|
| Eastbourne Depôt - - | 6 | 6lb. 10 oz. |
| „ Redoubt, No. 1. - | 100 | 0 12¾ |
| „ „ 2. - | 40 | 0 14 |
| **Aldershot Camp.** | | |
| Capt. Grant's Stoves, North, A. | 367 | 0 14 |
| „ „ B. | 387 | 1 2 |
| „ „ C. | 250 | 1 2⅓ |
| „ „ D. | 300 | 0 14⅔ |
| „ „ F. | 76 | 2 11 |
| „ „ I. | 90 | 1 12½ |
| | 80 | 1 0 |
| „ „ K. | 110 | 1 1 |
| „ „ L. | 200 | 1 6 |
| „ „ Q. | 225 | 1 6 |
| „ South, A. | 260 | 1 2⅓ |
| „ „ B. | 320 | 1 1½ |
| „ „ C. | 280 | 1 0¼ |
| „ „ D. | 218 | 1 1⅓ |
| „ „ H. | 585 | 0 12⅔ |
| „ „ I. | 90 | 1 12½ |
| „ „ M. | 260 | 0 14 |
| „ „ Q. | 410 | 0 12¾ |
| „ „ R. | 218 | 1 7½ |
| „ „ S. T. | 710 | 0 14½ |
| „ „ V. | 138 | 1 6½ |
| „ „ X. | 237 | 1 11⅓ |
| „ „ Y. | 150 | 1 9⅔ |
| „ „ Z. | 190 | 0 15 |
| **Permanent Barrack.** | | |
| *Centre Block.* | | |
| Capt. Grant's, Nos. 3 and 4. - | 640 | 1 4 |
| **St. George's, London.** | | |
| Captain Grant's - - | 137 | 2 5½ |
| **Woolwich.** | | |
| Captain Grant's, No. 1 - | 400 | 0 14½ |
| **Aldershot Camp.** | | |
| Permanent Barracks, common boilers and oven,— | | |
| East Block, No. 4. - | 138 | 1 7 |
| West Block, Nos. 1 & 2. | 540 | 1 4 |
| „ „ 3. | 70 | 4 0 |
| „ „ 4. | 62 | 3 0 |
| Field Battery, No. 1. - | 200 | 1 1 |
| „ „ 2. - | 200 | 1 1 |
| „ Hospital | 76 | 2 4 |
| „ Huts - | 130 | 1 3 |
| **Metropolitan Institutions.** | | |
| St. Bartholomew's Hospital - | 1,000 | Coal and gas equal to 10¾ oz. of coal. |
| Middlesex „ - | 200 | 4 0 |
| St. George's „ - | 200 | 1 2 |
| Foundling „ - | 300 | 3 0 |
| Christ's „ - | 1,000 | 0 8 |
| Blind School - - - | 184 | 1 3½ |
| Stranger's Home - - | 130 | 0 8 |
| Lincoln's Inn Hall - - | 300 | 4 8 |
| Temple Hall - - - | 150 | 7 0 |
| St. Luke's Union - - | 300 | 1 12 |
| Holborn „ - - | 600 | 0 8 |
| Clerkenwell „ - - | 500 | 1 2 |
| West London „ - - | 400 | 1 0 |
| Islington „ - - | 400 | 1 8 |
| Chelsea „ - - | 500 | 0 8 |
| Bethnal Green Union - | 900 | Coke, equal to 5 oz. of coal. |
| St. George's „ - - | 400 | 1 0 |
| Whitechapel „ - - | 600 | 6 10 |
| Strand „ - - | 200 | 0 10 |
| Hackney „ - - | 600 | 0 9 |

## XVI. SIMPLE RECIPES FOR COOKING IN BARRACKS.

The following simple rules to be observed :—Preparing beef and mutton for soup. If part of the ribs or loin, cut the flesh in one piece from the bone, attach the fat to the meat, chop up the bone, and place all in the boiler ; if part of the round, do not let each piece be more than 4 inches thick ; if clod or stickings, remove the bone and chop it into small pieces ; if rump, cut the meat away and break the bone; loin and neck of mutton, chop between each rib and cut the skin between the ribs to the depth of ¼ inch ; shoulder, cut off the shank bone and saw the blade bone into 4 pieces ; leg, remove the flesh in 4 pieces and break the bone. By following the above directions, the meat will eat tender and be better done.

Vegetables to boil for soup : Carrots and parsnips scrape, cut them in four lengthways and then across. Turnips to eat with the meat, wash ditto, not peel them, cut them in quarters from the top downwards ; for mashing, peel them and cut in slices crossways. Celery and leeks, cut them in four lengthways and then in lengths of ½ inch ; use red celery for soups ; onions for soup, cut in four and then in slices ; for sauce peel and boil whole. Greens, cabbages, and Scotch kail, wash well in salt and water, cut 2 inches up the heart of the cabbage, boil in plenty of water in nets. Sweet herbs, many may be obtained wild, such as bay leaf, thyme, mint, &c., all of which may be dried and kept for winter use, and add greatly to the flavour of the soup ; they should be tied together on a stone with a hole in it, kept for the purpose, and placed in the boiler half an hour before serving.

To try flour if good paste : wet the fingers, take a pinch ; if good it makes a smooth ball ; if bad it becomes clammy, or goes into grains. Sugar should have a shining and sparkling grain ; pepper, prefer black ; mustard, the darkest the best, mix with boiling water and a little salt ; vinegar of a dark colour is the best and most wholesome ; coffee, when ground in your own mills, use 1-6th of chicory.

Eggs for puddings : instead of eggs, 1 large handful of snow is equal to 2 eggs.

### BAKING.

*Toad-in-the-Hole.*

2 lbs. meat.
16 table-spoonsful of flour.
2 pints of water.
2 tea-spoonsful of salt.
½ tea-spoonful pepper.
2 onions.

Make a batter of the flour and water, chop up the onions, mix with it ; grease the pan, place in the batter, then the meat, cut in pieces of ¼ lb. each, well rubbed with salt and pepper. Bake 2 hours.

N.B. This batter with 3 eggs makes a Yorkshire pudding.

*Braised Beef with Vegetables.*

2 lbs. meat.
1 carrot.
1 turnip.
1 onion.
1 head celery.
1 tea-spoonful of salt.
½ tea-spoonful of pepper.
4 cloves.
2 bay leaves.
½ pint water.

Cut the meat from the bone, cut up the vegetables into small dice, place them in the baking dish, then

the meat, and then the bones; mix the salt and pepper with the water, which place in the pan with the cloves and bay leaf; cover over with a sheet of brown paper, well greased. Place in oven at ¼ past 9, at ½ past 11 remove the meat, thicken the liquor in the pan with a little flour and water, cut the meat up in pieces for the mess, put them back and replace in oven till wanted. Serve very hot.

*Nabob's Pie.*

9 lbs. meat. Paste of a quartern of
1½ lbs. stuffing. flour.
1 quart of water.

Cut the meat up in slices of half an inch thick, 6 inches long, and 2 inches wide; flatten them with a chopper; spread on each piece a bit of stuffing; roll the meat over it, and place them in a pie-dish or pan close together; there will be about fifty pieces. The bones may be left out or placed on the top; add the water, cover with the paste, and bake 2½ hours.

The stuffing is made with ½ lb. suet, 1 lb. of bread crumbs, 1 tea-spoonful of salt, ¼ spoonful pepper, 1 table-spoonful of chopped parsley, and 4 eggs.

*Baked Beef, Stuffed.*

9 lbs. of beef to ½ lb. stuffing.

Bone the beef, if it be brisket, flank, or edge bone, or a shoulder of mutton; add a little lemon thyme to the above stuffing, and form it into a ball, and place it where the bone was taken from, roll and tie it up and bake it on a trevet, with potatoes under; for mutton, onions added to the stuffing is an improvement.

*The Groat Pudding.*

9 lbs. meat. 24 cloves.
1 pint groats. 2 table-spoonsful salt.
12 small onions. 1 ditto pepper.

Cut the meat and bones into pieces of about ¼ lb. each; season with the salt and pepper; place in a baking dish with the groats previously soaked since the over night, and add the onions, with 2 cloves in each; add 4 quarts water, and cover with greased paper, and bake for three hours in a slow oven. The addition of a marrow bone is an improvement.

*Stewed Beef with Pickles in Oven.*

2 lbs. of beef. 2 table-spoonsful of
1 tea-spoonful salt. mixed pickles.
½ ditto ground allspice. 2 ditto of flour.
1 eschalot, or 1 tea-spoonful sugar.
2 onions. 1 pint water.
2 bay leaves.

Rub the meat with the salt, allspice, and eschalot cut up small; place it in the pan with the two bay leaves and the water; cover over with greased paper, or a board, or another tin; place in the oven at ½ past 9. Mix the flour, water, pickles, and sugar together in a canteen pan; boil until thick; add it to the meat at ½ past 11. Vinegar may be used if no pickles.

*Meat and Potatoes.*

2 lbs. meat. 2 tea-spoonsful salt.
2 lbs. potatoes. ½ ditto pepper.
4 onions. 1 ditto sweet herbs.
2 gills of water.

Cut the meat in slices, rub them with the seasoning; slice the potatoes ½ in. thick, the onions ¼ in. thick; dry and pound the sweet herbs; put the onions in the bottom of the pan, then the meat; strew the herbs over it; place the potatoes over the meat, the bones on the top; add the water and bake 2 hours.

*Meat Pie with Potatoes.*

Cover the above with crust. Apples when in season may be added.

*Meat Pie for 12 men.*

9 lbs. meat. 2 quarterns of flour.
1 large onion. 2 lbs. suet, dripping,
2 table-spoonsful salt. or lard.
1 tea-spoonful pepper. 1 pint of water.

Cut the meat into pieces of half an inch thick; chop up the onion small; rub the meat with the salt and pepper. Make the paste; roll it out to the thickness of half an inch; line the sides of the tin; place in the meat; sprinkle the onion over; add the water and cover with the paste; bake 2 hours.

## BOILING.

*Bengal Pot.*

9 lbs. of meat. 1 lb. rice.
6 onions. Sweet herbs.
6 apples. 2 table-spoonsful of salt.
2 capsicums. 1 stick of horseradish.

Cut the meat into convenient pieces to serve, peel and cut the onions small; place a little fat in the boilers with the onions and apples; keep stirring them round until they can be mashed; chop up the capsicums and place them in the boilers; insert the meat and cover with hot water; simmer very gently for one hour, then stir in 3 lbs. of rice; simmer slowly for 40 minutes. There ought to be very little gravy left, as the rice ought to have absorbed it all. Cauliflowers broken small, and added with the meat is an improvement; if required warmer seasoned, more capsicums or cayenne may be added, or curry powder.

*Stewed Steak in Boiler.*

9 lbs. meat. 2 table-spoonsful of salt.
4 onions. 1 ditto pepper.
2 table-spoonsful of flour.

The meat should be about 1 inch thick; place in the boiler some of the fat and onions chopped up; when nearly brown add the meat, which has been well beaten; stir it round and turn it over; season with pepper and salt; when nearly done and brown on both sides add water enough to cover it; damp the fire so that it only just simmers for half an hour; mix the flour with water, which add 20 minutes before serving. Vegetables cut up in slices may be added to it. Some kind of meat will require longer, and doing very slow.

*Meat Soup.*

18 lbs. meat. ¼ oz. pepper.
10 onions. 4 gallons water.
5 oz. salt. 5 oz. flour.

Separate the pieces of bone and muscle from the flesh, put the latter into a net and both into a pan or boiler holding four gallons of cold water; the onions cut up small to be added, and if any other vegetable is used it must be cut into small dice; simmer gently for 2 hours, take out the meat in the net, thicken with 5 oz. of flour, boil for 10 minutes, then damp the fire, either replace the meat in the net or keep it warm and separate.

*Pea Soup.*

Boil 1 quart of split peas in a cloth tied lightly, half an hour before serving take them out, mash them, and replace in the soup as above.

*Carrot, turnip, parsnip, and white beet* may be added to the above soup, either boiled in the soup and then mashed, or rasped previously to their being placed in it. With peas and vegetables never season the soup until it is done.

Parsley and marygolds may be used in all these soups. A little scraped horseradish makes a change. Sweet herbs and wild celery seed tied in a cloth may be added.

*Irish Stew.*

18 lbs. meat. 6 oz. salt.
75 good-sized potatoes. ¼ oz. pepper.
25 onions.

Cut the meat up in pieces of ¼ lb., loin and neck of mutton in chops, disjoint the shoulder and cut the blade bone in 4 pieces, if it is the leg in slices ¾ inch thick, place them in the boiler, then the potatoes, then the onions, season and add water just to cover the potatoes, stew gently for 2½ hours; keep the fire down during the cooking, and well covered over.

*Turkish Pilaff.*

| | |
|---|---|
| 18 lbs. meat. | 6 oz. salt. |
| 2 lbs. onions. | 1¼ oz. pepper. |
| 6 lbs. rice. | 4 gallons water. |

Cut the meat into small pieces and place in the boiler with some fat, having a *very gentle* fire under; add the pepper and salt, keep stirring until the meat is brown; cut the onions in slices and add to the meat; keep stirring for another 5 minutes, then add the *hot* water by degrees; when boiling put in the rice, simmer until the rice is tender, and serve very hot.

*Beef Pudding.*

| | |
|---|---|
| 1 lb. meat. | *Paste.* |
| 1 tea-spoonful of salt. | 1 lb. of flour. |
| ¼ do. pepper. | ¼ lb. of dripping, lard, or suet. |
| ½ do. flour. | 1 tea-spoonful of salt. |
| ½ do. chopped onions. | ¼ do. pepper. |

Free the meat from sinews, cut it in pieces lengthways and slanting against the grain; mix the flour, salt, and pepper and onions together, rub the meat well with it, and place it in a basin or dish, and cover with the paste, which make by mixing the flour, pepper, salt, and suet chopped very fine, and laying it on a board; make a well in the centre, add sufficient water to make a stiff paste, put a little flour on the board and let the paste remain on it for 5 minutes, roll it to the thickness required.

Chopped parsley, thyme, or mushrooms may be added. Chopped gherkins and oysters is an improvement, and if the meat is very lean a black pudding.

*Suet Pudding.*

| | |
|---|---|
| 1 lb. of flour. | ¼ pepper. |
| ¼ lb. of suet. | 1 gill of water. |
| 1 tea-spoonful of salt. | |

Mix all well together, flour the cloth and place it in it, boil 1 hour and a half.

It may be made as dumpling, rolled in flour and boiled in soup.

A little mixed spice makes a variety, and particularly ginger.

It will also do for apple and rhubarb dumpling, leaving out the pepper.

*Spotted Dick.*

The above without the pepper, and new made ale instead of water, with ½ lb. of currants, will make a good pudding. It should be boiled in a cloth. The *outward fat* of loins and necks of mutton, cut up small, is preferable to suet.

*Boiled Rice Pudding.*

1 lb. rice. ¼ oz. mixed spice. 1 lemon peel.

Wash the rice, and mix it with the spice and peel chopped fine, put it in a cloth allowing it plenty of room to swell, boil two hours, and serve with a little butter.

*Baked Rice Pudding.*

| | |
|---|---|
| 1 lb. rice. | 1 tea-spoonful of salt. |
| 3 quarts water. | 1 peel of lemon. |
| 4 oz. sugar. | |

Boil the water. When boiling add the rice, sugar, salt, and peel cut up. Boil gently half an hour, by this time the rice should have absorbed all the water.

| | |
|---|---|
| 1 pint of milk. | ½ tea-spoonful of powdered cinnamon. |
| 3 oz. sugar. | |

Mix in a pint of milk, 3 ozs. sugar, 4 table-spoonsful of flour, half a tea-spoonful of powdered cinnamon. Add it to the rice, grease a baking dish and place it in it, and bake 15 minutes or longer, according to the oven.

*Coffee.*

One ounce of coffee to six persons, with six pints of water; or for fifty take ½ lb. of coffee and 6 gallons and 1 quart of water. Boil the water. When boiling add the coffee, having previously taken out 2 quarts; let it boil up once, stir it round and add the 2 quarts of water, remove all the fire from under the boiler, add 1 pint of cold water, let it settle, remove it without disturbing the bottom, that which is thick strain through some linen; add the milk and sugar after it has been taken from the boiler.

## XVII. SIMPLE RECIPES FOR COOKING IN MILITARY HOSPITALS.

*Beef Tea.*

| | |
|---|---|
| 3 lbs. of beef. | 1 tea-spoonful of sugar. |
| ½ lb. of vegetables. | 2 oz. butter. |
| 1 oz. salt. | 1 gallon water. |
| 1 salt-spoonful of pepper. | |

Cut the meat up in small pieces, and chop up the bones; cut up the vegetables, which should be turnips, carrots, celery, and parsley, and place them with the meat, seasoning, and butter, into the boiler or stewpan, with half a pint of water, over a sharp fire; stir them continually for 10 minutes, add the remainder of the water, which should be boiling; damp the fire, and simmer for one hour; throw in a pint of cold water, and in 3 minutes pass through a sieve; skim off the fat, and serve.

*Mutton Broth.*

| | |
|---|---|
| 1½ lbs. mutton. | 1 tea-spoonful of parsley. |
| 2 tea-spoonsful of rice. | 1 middle-size onion. |
| 1 do. salt. | 2 quarts water. |
| 1 turnip. | |

Divide the bones of a scrag of mutton, put it with the vegetables and rice in a stewpan; boil gently for one hour in 2 quarts of water, season, skim off the fat, and serve. The mutton and turnip separate.

*Chicken Broth.*

Like the mutton broth, only using a fowl instead of mutton and a blade of mace.

Barley, groats, &c. may be used instead of rice.

*Fish Broth.*

To be used in all cases where invalide turtle would be recommended.

| | |
|---|---|
| 3 lbs. of skate. | 12 peppercorns. |
| 1 old hen or cock. | 1 small bunch of sweet herbs. |
| 1 knuckle of veal. | 1 handful of chervil. |
| 1 ox tail. | |
| 4 blades of mace. | |

Boil the skate separate in 3 quarts of water for 2 hours, strain it and allow it to get cold, and remove the fat; if skate cannot be had, a large cod's head, or a large haddock or 4 soles may be used.

Boil gently the fowl, veal, and tail in 6 quarts of water for 4 hours, strain it, it will give 3 quarts of good stock; let it get cold, and remove the fat. When wanted mix both stocks, add the spice and herbs, season with salt to taste, strain and serve.

*Sago Broth.*

¼ pint sago. 1 quart of beef tea.

Soak the sago in cold water for 4 hours, then boil it, one quart of either beef tea, mutton broth, or chicken broth for 1 hour, or, if preferred with milk.

*Bread Pudding.*

| | |
|---|---|
| ½ lb. bread. | 3 do. of brown sugar. |
| 1 egg. | 1 pint milk. |
| 2 table-spoonsful of flour. | 1 salt-spoonful of salt. |

Cut half a pound of bread very thin, lay it in a pie dish, mix the milk, egg, flour, sugar, and salt together, pour over the bread and bake for half an hour.

*Ground Rice Pudding.*

½ lb. ground rice — 2 eggs.
2 oz. sugar. — 1½ pint milk.
1 oz. butter.

Boil 1 pint of milk, mix the rice with half pint cold milk, sugar, and butter, add this to the boiling milk, which remove from the fire as soon as it boils, keep stirring it, break in the eggs, butter a pie dish, and bake in a slow oven.

*Calvesfoot Jelly.*

2 calves' feet. — ½ lb. lump sugar.
½ pint of wine. — 4 lemons.
5 eggs.

Boil the calves' feet in three quarts of water for five hours, keeping it skimmed; run it through a sieve into a basin, and let it remain until cold; then remove the oil and fat. Then put in a stew pan the whites and shells of the eggs, the juice of the lemons, and the rinds of two; then add the sugar, the wine, and half pint of water, whisk them all up together, and boil them; then place in the jelly stock, which will be about three pints, stir it well until boiling, and pass it through a jelly bag. A little cinnamon and a few coriander seeds gives it a nice flavour.

*Ground Rice Jelly.*

¼ lb. ground rice. — 2 oz. butter.
2 oz. sugar. — 1 qrt. milk.

Mix the rice, sugar, and butter in half a pint of cold milk, boil the remainder, which add gradually; place it on the fire, and keep stirring all the time; from 15 to 20 minutes will do; it depends on the nature of the rice. Oil a mould or pie dish, pour it in, and let it get cold, and turn it out. Flavour with any spice or essence.

*Arrowroot Milk.*

¼ lb. of arrowroot. — ½ lemon
2 oz. lump sugar. — 2½ pints milk.
Pinch of salt.

Peel the lemon, and add it with the rest in a pan, boil it for 10 minutes, stirring gently, and serve.

This may be made with water.

*Macaroni Pudding.*

2 oz. macaroni. — 1 egg.
2 oz. lump sugar — ½ ounce butter
¼ pint milk. — ½ table-spoonful of flour.

Break the macaroni and boil in 2 pints of water; when done, strain it, add to the milk the flour and sugar, then the macaroni; boil for 10 minutes; remove from the fire, and break 1 egg well beaten up into it, add the butter, and place in a pie dish, and bake or steam. Any flavour may be given to it.

*Sago Pudding.*

¼ lb. sago. — ½ oz. butter. — ½ pint milk.
2 oz. sugar. — 2 eggs.

The sago should have been soaked; boil it in the milk and sugar until thick, but keep stirring; remove it from the fire; beat up two eggs, mix quickly with it, and place it in a pie dish or basin, and bake or steam.

*Tapioca Pudding.*

2 oz. tapioca. — 2 eggs.
1½ pint milk. — 1 pinch of salt.
1 oz. lump sugar.

Proceed as for the sago; it will take 20 minutes to bake or steam.

*Custard Pudding.*

1 pint milk. — 3 eggs.
1 oz. sugar. — ½ bay leaf.

Boil the milk, sugar, and bay leaf for 5 minutes; break and beat up 3 eggs, butter a basin, pour the milk on the eggs, put all into the basin, and place in a stewpan half full of water for 25 minutes, or steam it for 20 minutes.

*Plain Oatmeal.*

¼ lb. oatmeal. — ½ tea-spoonful of salt.
1½ oz. sugar. — 3 pints of water.

Mix the above, and boil slowly for 20 minutes, *stirring continually*, and serve.

*Barley Water.*

2 oz. barley. — ½ lemon.
2 oz. lump sugar. — 7 pints of water.

Peel the lemon, and put it with the barley, sugar, and water into a stewpan, and boil for two hours, strain, and serve.

*Cream of Tartar Water.*

1 oz. cream of tartar. — 2 oz. sugar.
2 lemons. — 2 quarts water.

Take the juice of two lemons, and the rind of one, add it with the cream of tartar and sugar into a jug, pour boiling water over, when cold, use it.

*Lemonade, when Lemons cannot be had.*

Four ounces of tartaric acid.
Two drachms of oil of lemon.

One tea-spoonful in a pint of water, with half an ounce of sugar, will make good lemonade.

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Sir, London, 8th July 1859.

In obedience to the instructions contained in your letter of the 24th January ult., we beg to state that we have examined the workings of the various apparatus and kitchens as required, the results of which are detailed in the enclosed Report, which we trust will meet with the approbation of the Commissioners.

We beg to add that in the discharge of our duties we have had occasion to be frequently with the private soldier, and thus have heard opinions stated that officers and others could not obtain; they all express great gratitude for the exertions which are being made in ameliorating their condition, more especially in that connected with their food, in giving them the opportunity of having baked meat instead of always boiled; they all agree that these advantages will not receive their full development if the present system of making the last recruit the cook, and changing them weekly, be continued; one uniform system should be adopted in all branches of the service, and a permanent cook to each kitchen appointed out of the regiment, removable on bad conduct: this is done in some regiments with great advantage, and might be done in all.

We have, &c.
G. Warriner.
A. A. Guerrier.

To F. W. Lancaster, Esq.,
Secretary of the Barrack and Hospital
Improvement Commission.

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## REPORT ON THE OVEN ERECTED IN THE ST. GEORGE'S BARRACKS.

(Vide General Report, Fig. 57.)

This oven is of the same size as many already erected, as at the Albany, and St. John's Wood barracks, but set in a different manner, on a plan suggested by Captain Galton, with a view of preventing the destruction of the bottom of the oven by the fire, and to ensure more equal heating, and economy of fuel, for

which purpose a fire tile is placed between the fire and the oven, as well as a space between them of 3 inches, the smoke is made to circulate round the oven, and the bottom is the last part it comes to, the tiles being nearly red hot consume the soot as it passes over them, therefore little goes up the chimney, the heat in which, just over the damper, never exceeds 110 degrees Fahrenheit. Having tried this oven for several days with various kinds of fuel, the following is the result I have arrived at :—

To prepare it for baking in order to have the meat ready by 12 o'clock, the fire should be lighted by half-past 7, by 9 o'clock the upper part of the inside of the oven will have attained 270 degrees Fahrenheit, and the lower part 230 degrees, more than sufficient to bake properly. To obtain this heat it takes from 20 to 25 lbs. coals, according to quality ; after the first quarter of an hour, there is no necessity for placing any more coal on the fire ; the fire being clear, the damper may be closed, and the heat increases in the oven 10 to 20 degrees. It holds 8 baking tins of the size of 23 inches long by 12 inches wide, each tin is sufficient for one company, single bakes, if it does not exceed 50 men, and will bake them with 25 lbs. of coal ; but if there are only 4 tins, one side may be used by keeping one damper closed, in which case less fuel is required ; on one occasion I covered the fire with a mixture of loam and cinders, which I put on at half-past 2 ; at 10 o'clock the next day there was an excellent fire, and the oven 110 degrees Fahrenheit.

I am not aware that an oven of this plan is erected in any part of England ; it is like those in Suffolk as regards the divided flue, but which have not the space between the fire tile and the bottom of the oven, and which in my opinion constitutes its advantage in being a smoke consumer.

I consider it at the *present moment* the best iron oven that is erected in regard to uniformity of heat ;—that heat being proper for baking meat, also because it cannot be quickly destroyed by the fire, and on account of the small amount of fuel it consumes ; it is well adapted for hospital use, as the fire can be kept up with very little expense, and the top heat is good for small puddings.

In its future construction I would recommend :—1st. For Hospital use, there should be two shelves, made of sheet iron with holes in it. 2nd. The front to be made in two pieces, so that the lower part may be removed, in order to replace the fire clay sides when burnt out. 3rd. The fire tile over the fire not to join in the middle, but to be in one piece. 4th. The top tiles to be 4 inches thick instead of 3 inches. 5th. The ash pit to have a box to contain water, which should be within 6 inches of the fire bars. 6th. The fire clay sides of the furnace should be of the very best material ; a great difference exists in the qualities of fire clay ; the late Mr. Wedgewood is the best authority we have on this subject. I made it an object of great study in the years 1849 and 1850, in constructing a fire clay oven for the Exhibition of 1851, and I found a mixture of fire clay and grit,* as made by Messrs. Rufford and Finch of Stourbridge, the cheapest and best for the purpose ; there is also a clay at Bovey Tracey, Devon, which is adapted for *large* fire lumps ; the holes should be made on the angle that would cause the draught of air to meet over the *middle* of the fire, and no iron pipes should be in them, as the same effect may happen as with the dampers in Benham's stove at Edinburgh.

These alterations, however, have nothing to do with the mode of heating the oven, the results of the various trials of so doing are surprising.

April 27, 1860. G. Warriner.

* Called by the makers " Grog."

## FURTHER REPORT ON KITCHENS IN ENGLAND AND SCOTLAND.

### NORTHAMPTON.

Barrack constructed to hold 218 men, cavalry, artillery, and infantry.

*Description.*—Two kitchens, at present used as stores :—

*C. Wing.*—Two rows of boilers, 5 large oval, and 3 oblong, set in brickwork, and out of order.

*A. Wing.*—7 oval boilers and a brick oven.

*Number cooking.*—124.

*Coals.*—228 lbs. per day.

*Present state.*—Several of the boilers require repairs.

*Remarks.*—The brick oven takes 160 lbs. of coal, and 1½ hour to heat, it bakes 8 tins with 31 messes in each tin, but *full* bakes require 2 tins for that number, therefore it will only bake for 124 men with 160 lbs. of coal.

*Hospital.*

Constructed for 17 men, average 10.

*Kitchen* has an excellent range, with oven and boiler, all is good and proper.

*Water.*—Good.

*Coals.*—Inland.

### WEEDON.

Constructed for 431, cavalry, artillery, and infantry.

*Description.*—Two kitchens.

No. 1.

5 oval boilers set in brick. A brick oven.

*Number cooking.*—58 men.

*Coals.*—80 lbs. per day.

No. 2.

5 oval boilers.

*Number cooking.*—56 men.

*Coals.*—80 lbs.

*Present state.*—Good.

*Remarks.*—The oven is not used, as the men have not coals enough.

*Hospital.*

Constructed for 38, average patients 12.

*Kitchen* with a good grate, with oven.

*Water.*—Good.

*Coals.*—Inland, 12*s.* per ton.

There are no married men's rooms, but married men are there, and use the Anglo-American stoves for cooking, for which they are not adapted.

### NOTTINGHAM.

Constructed for 178 cavalry.

*Description.*—One kitchen, containing 8 large oval boilers 4 ft. 3½ in. circumference, 15¼ in. deep; 4 small oval boilers 3 ft. 1 in. circumference, 12¼ in. deep.

Unoccupied.

*Present state.*—Bad.

*Remarks.*—The boilers are placed in the middle of the kitchen. I would recommend that a small oven replace one of the small boilers at the end. No water in the kitchen, it would be advisable to lay it on, it is supplied from the town and paid for by meter. There would be less waste than by the present plan.

*Hospital.*

*Kitchen.*—4 ft. grate. 1 large round, and 1 oval boiler. This requires remodelling.

Eight married men's rooms, large grates.

No oven in the barracks.

*Coals.*—Inland, 8*s.* 6*d.* per ton.

### STALLINGBORO' BATTERY.

6 guns, 40 men.

*Description.*—Small kitchen with 2 oval boilers,

and good iron oven. It is not in use, as there are only 4 men and a master gunner in the battery.

*Hospital.*

A small grate. No oven.
*Coals.*—Inland.
*Water.*—Good ; the place is aguish.
*Remarks.*—The married men have no ovens, and the oven in the kitchen takes more coals than they can spare. It would be advisable for the master gunner to have a grate with an oven, so that they may have a baked dinner occasionally.

## SCARBORO' CASTLE.

For 124 artillery.
*Description.*—A kitchen with 4 oval boilers in good condition. Not occupied.
*Remarks.*—An oven is required, as it is too far from the town to send the meat to be baked.

## SUNDERLAND FORT.

Constructed for 316 infantry.
*Description.*—Two kitchens.

No. 1.

6 good oval boilers, 2 circular iron ovens.
*Number cooking.*—300.
*Coals.*—300 lbs. per day.

No. 2.

A round cook-house like those of Croydon and Walmer, having 8 large and 8 small oval boilers, not in use.
*Present state.*—Boilers good. Oven bottoms burnt out, and filled with fire-clay.

No. 2 not fit to use.
*Remarks.*—These ovens are made with front to fall down, and to rest on brackets, these brackets are not long enough, therefore the doors are constantly breaking off ; they are also badly set. The men have not coals enough, and have been obliged to buy. One kitchen would be sufficient if properly done.

*Hospital.*

Constructed for 28, average 10.
*Kitchen.*—Small room 12 ft. × 12 ft. with a very old grate, and small circular oven with bottom out, and small boiler separate; all very bad.
16 married men's rooms, stoves bad.
*Water.*—Good.
*Coals.*—Newcastle.

## YORK.

Constructed for 336 cavalry.
*Description.*—Two kitchens.

No. 1.

12 *round* boilers set in brick, with flush fronts, 1 iron oven holding 12 tins.
*Number cooking.*—120 men.
*Coals.*—80 lbs. per day.

No. 2.

12 round boilers as No. 1 ; 1 iron oven.
*Number cooking.*—156 men.
*Coals.*—120 lbs. per day.
*Present state.*—Boilers bad. Oven good, but badly set.
*Remarks.*—The whole require resetting. The ovens take 120 lbs. of coals to heat them, they are not provided with soot doors, and no rakes or means to clean out the flues. The boilers take 80 lbs. of coal each per day. The men have to buy coal.

*Hospital.*

Constructed for 18, average 14.
Kitchen grate is burnt out, and in bad condition.
2 boilers, one of copper not fit to use ; all want remodelling.
*Water.*—Good.
*Coals.*—Inland.

## SOUTH SHIELDS.

A 2-gun battery occupied by coast-guard.

## NORTH SHIELDS.

### Clifford's Fort.

Constructed for 29 men.
*Description.*—No cook-house ; the place is occupied by a master gunner and 2 invalided gunners, who cook in their rooms.
The Governor's house is let to the county.

*Hospital.*

For 15 men.

## TYNEMOUTH CASTLE.

Constructed for 236 infantry.
*Description.*—One kitchen containing 4 oval boilers set in brick ; a brick oven 4 ft. 6 in. × 2 ft. 6 in.
*Number cooking.*—50.
*Coals.*—80 lbs. per day.
*Present state.*—Very good, quite new.
*Remarks.*—The men never bake, not having coals enough, the oven alone would take all the coals.

*Hospital.*

For 27, average 16.
*Kitchen.*—Open grate and separate boilers.
*Water.*—Good but scarce.
*Coals.*—Newcastle.

## TYNEMOUTH.

### Spanish Fort.

7 guns.
Occupied by coast guard, containing three 2-room cottages ; they have grates and circular ovens all in good condition.

## NEWCASTLE.

Constructed for 474 cavalry and infantry.
*Description.*—Two kitchens.

No. 1.

16 oval boilers, 4 iron ovens — set in the middle of kitchen.
*Number cooking.*—213.
*Coals.*—1,600 lbs. per week, or 228 per day, all gone in six days.

No. 2.

14 various size boilers ; 1 iron oven.
*Number cooking.*—194.
*Coals.*—1,600 lbs. per week, or 228 per day, not enough to bake.
*Present state.*—Good.
*Remarks.*—The boilers should be reset to consume less coal.

*Hospital.*

Constructed for 24, always full.
*Kitchen.*—Open range, circular oven, and small boiler ; boiler in wash-house used for dinners, this requires remodelling.
*Water.*—Good.
*Coals.*—Good.

## HOLY ISLAND FORT.

This has been in occupation by the coast guard, but it is now being fitted up for artillery practice ; there is room for 48 men and 1 officer. This should have a set of Captain Galton's 2 boilers and oven.
*Water.*—Good, but a long way to get it.
*Coals.*—Newcastle. There should be a crane and pulley from the rock to lift up the coals and water.

## BERWICK.

Constructed for 720.
According to the new regulations only half that number.
*Description.*—Two kitchens.

No. 1.

6 oblong boilers set lengthways.

No. 2.

1 oval and 5 oblong boilers, set lengthways, not in use.

*Remarks.*—They are in a very bad state, and I would recommend a different arrangement, as the boilers are not fit to reset.

No married men's rooms.

*Water.*—Good.

*Coals.*—Inland and Newcastle.

## CARLISLE CASTLE.

Constructed for 282 infantry.

*Description.*—Two kitchens.

No. 1.

3 large round boilers.
4 small oval „
2 circular ovens, not in use.

No. 2.—Rampart kitchen.

6 old round boilers.
1 small oval boiler, not in use.

*Remarks.*—No. 1 in very bad state, oven doors off. No. 2, not fit to use.

*Hospital.*

*Kitchen.*—Grate with small circular oven separate.

*Coals.*—Whitehaven.

## LANCASTER.

The barracks here belong to the county, but there is a hospital which belongs to the War Department. It has been a private house, and is adapted to hold 20 patients. The kitchen has a grate with oven and hot plate.

*Coals.*—Whitehaven.

## PRESTON.

Constructed for 141 cavalry, 66 artillery, and 998 infantry.

*Description.*—Four kitchens.

No. 1, infantry.

16 oval boilers, 8 at each end.
1 brick oven in the middle, not in use.

No. 2, infantry.

The same.

No. 3, cavalry.

4 oval boilers.
Brick oven.

No. 4, artillery.

The same.

*Remarks.*—All in very good order.

*Hospital.*

Constructed for 100.

Stove with oven, 1 boiler separate, well adapted for 30 men and no more; everything in good order.

*Coals.*—Wigan.

Married men's rooms; ranges without ovens.

## LIVERPOOL.

### North Fort.

204 artillery.

*Description.*—One cook-house containing 8 oval 25-gallon boilers set in brick.

*Number cooking.*—25 men.

*Coals.*—57 lbs. per day, 2 lb. 4½ oz. per head.

*Remarks.*—The boilers are badly set; the quantity of coal is hardly sufficient; an oven is required.

*North Fort Hospital.*

Constructed for 24, average 6.

*Kitchen.*—Stove with oven and boilers. An excellent kitchen and everything in proper order.

*Coals.*—Wigan.

## EVERTON BARRACK.

For 100 infantry.

*Description.*—A kitchen containing 4 oval boilers attached to a long building of 4 rooms, unfurnished, and allowed to be used by the militia; all in good order.

## LISCARD BATTERY.

7 guns, 30 men.

*Description.*—Kitchen, with 3 oval boilers in good condition, not in use.

Requires an oven.

*Water.*—Brackish.

## PERCH ROCK.

10 guns, 60 men.

*Description.*—Three oval boilers, brick oven, not in use. Good, quite new.

*Water.*—Brackish. They obtain their supply of good water from a spring in the sands at low water, which is now being taken away by drainage.

## CASTLETOWN BARRACKS, ISLE OF MAN.

Constructed for 55 infantry.

*Description.*—Kitchen, with 2 large oval boilers and one small oblong set in brick.

A very small iron oven with a grate in another place, not in use.

Boilers in good condition, but a small oven required.

*Hospital.*

Constructed for 6, average 3.

*Kitchen.*—Small grate; no boiler or oven. The serjeant cooks for the patients in his room.

*Water.*—Good. Drainage into a cess-pool, which can never be emptied, and causes a nuisance.

## PEEL CASTLE.

A 2-gun battery.

In charge of a gunner, but no accommodation.

## DOUGLAS BATTERY.

2 guns.

The same as Peel.

## CHESTER.

Constructed for 291 infantry.

*Description.*—Two kitchens.

No. 1.

9 large oblong boilers set in brick.

Iron oven, the same as the Wellington Barracks; been in use 6 weeks, and burnt out two sets of bars.

No. 2.

6 small oblong boilers set in brick.

Iron oven, same as No 1, not in use.

All in good order; gave directions how to prevent the bars being burnt out.

*Hospital.*

Constructed for 28, average 14.

Separate building outside the Castle.

*Kitchen.*—Grate with oven.

Small boiler separate.

All in good order.

*Coals.*—Wigan.

## MANCHESTER.

### Hulme.

Constructed for 464 cavalry.

*Description.*—Two cook-houses.

No. 1.

3 sets of Captain Galton's treble boilers.
1 brick oven.

*Number men.*—100.

*Coals.*—114 lbs. per day.

*Present state.*—All in good order; the ball tap requires altering to prevent too much water entering the boilers.

No. 2.

Like No. 1.
*Number cooking.*—176 men.
*Coals.*—171 lbs. per day.
*Present state.*—Good.
*Remarks.*—These men bake every day and like the boilers very much. It will be seen that they consume less coal than any other.

*Hospital.*

Constructed for 46, average 25.
*Kitchen.*—4 feet range with oven and boilers.
2 large oval boilers.
All in good order.
Married men's quarters, small stove with oven, consume 200 lbs. per week.
*Coals.*—Wigan.

## SALFORD.

Infantry.

*Description.*—Three kitchens.

No. 1.

13 oval boilers in centre of kitchen in brick, 2 have iron fronts.
1 brick oven.
*Number cooking.*—300.
*Coals.*—343 lbs. per day.

No. 2.

12 oval boilers against wall, 1 brick oven, not in use.

No. 3.

Same as No. 1 ; 4 have iron fronts.
*Number cooking.*—240.
*Coals.*—320 lbs. per day, and last only six days.
*Present state.*—Good, except ovens. No. 1 takes 3 hours and 3 boxes of coal to heat it, and No. 3, 4 hours and 3 boxes.
*Remarks.*—This is the same coal as at Hulme, and the difference in the consumption may be easily seen. Iron fronts are gradually being put to the boilers, in doing so they should be set according to the new plan.

*Hospital.*

For 56, average 20.
*Kitchen.*—Range, oven, and boilers.
2 large oval boilers ; all good.
Married men, same accommodation as Hulme.

## STOCKPORT.

162 infantry.
*Description.*—Six oval boilers set double in brick; 1 brick oven, unoccupied.
The double boilers are in good condition, but require double fronts.

*Hospital.*

*Kitchen.*—4 ft. range, oven and boilers. 1 oblong boiler set lengthways ; all in good condition.

## ASHTON.

Constructed for 70 cavalry and 270 infantry.
*Description.*—Two kitchens.

No. 1, infantry.

7 oval boilers, 1 brick oven.

No. 2, cavalry.

3 oval boilers, 1 brick oven.
*Present state.*—New and good.
*Remarks.*—Not being occupied, I could not tell the consumption, but by the way the flues are constructed there will be a large consumption of coal. I should recommend them being re-set on the new plan, and iron fronts.

*Hospital.*

*Kitchen.*—4 ft. range, oven and boiler ; all in good order.
*Water.*—Not very good.
*Coals.*—Wigan.

## BURY.

70 cavalry, 270 infantry.
*Description.*—

No. 1, infantry.

7 oval boilers set in brick, and brick oven.

No. 2, cavalry.

3 oval boilers ; brick oven.
Unoccupied.
*Present state.*—Good.
*Remarks.*—These barracks being like Ashton, the same remark applies to the boilers here.

*Hospital.*

*Kitchen.*—4 ft. range, oven and boilers ; all in good order.
*Coals.*—In the neighbourhood.

## BURNLEY BARRACKS.

140 cavalry, 114 infantry.
*Description.*—Two kitchens.

No. 1, cavalry.

4 large oval boilers set double in iron ; brick oven.

No. 2, infantry.

Same as No. 1.
Not occupied.
*Present state.*—Good.

*Hospital.*

*Kitchen.*—Range, boiler and oven ; 1 oblong boiler set lengthways.
*Water.*—Good, but scarce.
*Coals.*—Inland.

## LEEDS.

360 cavalry.
*Description.*—Two kitchens.

No. 1.

8 oval boilers set in brick ; iron oven.

No. 2.

Like No. 1.
Unoccupied.
*Present state.*—Oven bottoms burnt out.
*Remarks.*—The fireplaces too large ; kitchen too narrow.

*Hospital.*

For 26, average 11.

*Kitchen.*—Range, with oven ; boilers separate.
*Coals.*—Good, 8*s.* 6*d.* per ton.

## SHEFFIELD.

Constructed for 601 infantry, and 282 cavalry.
*Description.*—Four kitchens.

No. 1, infantry.

7 oval boilers, 1 brick oven.

No. 2.

9 oval boilers, 1 brick oven.

No. 1, cavalry.

5 oval boilers, 1 brick oven.

No. 2.

6 oval boilers.
*Present state.*—Good, except No. 1 oven.
*Remarks.*—These boilers, when the flues are worn out, should be re-set according to the new plan, and one oven only used for the infantry.

*Hospital.*

*Kitchen.*—4 ft. 6 in. range, oven and boilers ; oval boilers for hot water.
In good condition.
*Coals.*—Inland.

## BIRMINGHAM.

Constructed for 199 cavalry.
*Description.*—One kitchen containing 9 oval boilers set in brick.

*Number cooking.*—70 men.
*Coals.*—100 lbs. per day.
*Present state.*—Brickwork out of order.
*Remarks.*—Oven very good.

*Hospital.*

*Kitchen.*—3 ft. range, boiler at back for baths; separate iron oven; 1 large and 1 small oval boiler. Good condition.
*Water.*—Good.
*Coals.*—Inland.

## COVENTRY.

192 cavalry.

*Description.*—One kitchen containing 5 oval boilers, brick fronts; 1 small brick oven.
*Number cooking.*—60.
*Coals.*—80 lbs. per day.
*Present state.*—One boiler out of order.
*Remarks.*—The oven takes but 50 lbs of coal.

*Hospital.*

*Kitchen.*—3 ft. range and oven. Small boiler.
*Coals.*—Inland.

## BRADFORD.

300 infantry.

*Description.*—Two cook-houses :—
*Hut Kitchen.*—2 oval boilers; 1 small iron oven, hot plate.
*Barrack Kitchen.*—6 oval boilers set in brick; 2 iron ovens : unoccupied.
*Present state.*—Good, but ovens want a soot door.
*Remarks.*—The cavalry quarters and kitchen done away with, the latter used as a wash-house.

*Hospital,* now building.

*Water.*—Good, but costs 40*l.* per quarter when the troops are here.
*Coals.*—10*s.* per ton. The barrack is over a coal field.

## FLEETWOOD.

This building has been an hotel, with excellent kitchen, not yet occupied, and will require a few alterations, to adapt it for the troops.

## DUNBAR.

Accommodation for 108. Formerly a private residence; fitted up as a barrack.
*Description.*—Five oval boilers, not in use.
*Remarks.*—In good condition, but one boiler should be removed, and replaced by a small iron oven.
*No Hospital,* but one very much required. The married men's rooms, except 3, have the grates that were in the house when taken, which are too large.

## PIERSHILL.

Constructed for 354 cavalry.

*Description.*—Five kitchens.

No. 1.

10 oval boilers, brick fronts, and 1 brick oven holding 14 tins.
*Number cooking.*—40 men.
*Coals.*—34 lbs. per day.

No. 2.

8 oval boilers in brick.
*Number cooking.*—54 men.
*Coals.*—68 lbs. per day.

No. 3.

4 large oval.
*Number cooking.*—50 men.
*Coals.*—46 lbs. per day.

No. 4.

8 oval boilers, set well.
*Number cooking.*—118 men.
*Coals.*—92 lbs. per day.

No. 5.

6 small old oval boilers; 1 brick oven not in use but the oven when used takes 120 lbs. coals.
*Present state.*—Good, except the boiler in No. 5.
*Remarks.*—The men complain of the small quantity of coals and state that they have to buy them every week; they now bake twice in the week, in No. 1 oven, and supply it with coals from each kitchen.

*Hospital:*

Constructed for 32, average 20.

*Kitchen.*—A good range with oven, &c., and altogether very good, except the pudding tins and soup cans.
Serjeants' mess, 19 non-commissioned officers. A 4 ft. 6 in. Flavell's kitchener, burns well, but consumes a very large amount of coal.
*Water.*—Good.
*Coals.*—Inland and bad.

## EDINBURGH CASTLE.

Constructed for  infantry.

*Description.*—Benham's apparatus, see "Special Report."

*Hospital.*

For 36 patients, always full.

*Kitchen* contains 1 iron grate, 1 small iron oven, 2 oval boilers, all in bad condition. The kitchen small, low, under sleeping rooms, no ventilation, and unfit for use, and ought to be at once condemned.

## LEITH FORT.

Constructed for 241 artillery.

*Description.*—One kitchen containing 9 oval boilers, 1 brick oven holding 14 tins.
*Number cooking.*—60 men.
*Coals.*—80 lbs. per day.
*Present state.*—Good.
*Remarks.*—They complain that there is not sufficient coals to bake often, the oven takes more than the day's allowance; if the barracks were full there would be enough with 1 lb. per head.
*Water.*—Good.
*Coals.*—Inland and bad.

## GREENLAW.

Constructed for 224 infantry.

*Description.*—One kitchen containing 6 large oval boilers in brick.
*Number cooking.*—180 men.
*Coals.*—160 lbs. per day.
*Present state.*—Good.
*Remarks.*—The kitchen from wall to wall is only 8 feet; not room enough to stoke the fire.
A curious illustration occurred here about the baked meats. The men are companies of the 78th Highlanders quartered at Edinburgh; it is thought that the Scotch do not like baked meat, preferring the hotch potch. Since the men have been using Benham's apparatus with the oven, they prefer baked meats, and complain that they have no oven here.
*Water.*—Good.
*Coals.*—Inland.

## BLACKNESS CASTLE.

Artillery.

It is supposed to hold 56.
It has no kitchen or washhouse. It contains several barrack rooms, with some good, and some bad fire-places.
The master gunner's room has a new range 3 feet 6 inches.

## STIRLING CASTLE.

Constructed for 470 infantry.

*Description.*—Two kitchens.

No. 1.

8 oval boilers, 1 small iron oven 2 feet by 2 feet.
*Number cooking.*—338 men.
*Coals.*—326 lbs. per day.

No. 2.

12 oval boilers, not in use.

*Present state.*—Good, except oven in No. 1.

*Remarks.*—The men complain of the coals, and not sufficient oven room.

*Hospital.*

Constructed for 39, now holds 48.

*Kitchen.*—6 feet range, an oven, and oval boiler.

13 married men's rooms; no oven.

*Water.*—Good. Ventilation bad.

*Coals.*—Inland.

## PERTH BARRACKS.

367 cavalry and infantry.

*Description.*—Two kitchens.

No. 1.

Contains a row of 15 small oval boilers never used, and 4 large oval boilers.

*Number cooking.*—55 men.

*Coals.*—80 lbs. per day.

No. 2.

11 small oval, never used; 4 large oval.

*Number cooking.*—165 men.

*Coals.*—183 lbs. per day.

*Present state.*—The large boilers are good, but the small ones not fit to use.

*Remarks.*—The men have plenty of coals, which are very good and cost 11*s.* 6*d.* per ton.

*Hospital.*

Constructed for 20, average 15.

*Kitchen.*—4 feet bar range, 2 oval boilers set in brickwork, flush.

*Coals.*—Consumed 375 lbs. per week.

All the rest right.

No married men's rooms.

*Water.*—Good.

*Coals.*—Inland.

## DUNDEE.

Constructed for 301 infantry.

*Description.*—One kitchen, containing 8 oval boilers set in middle of kitchen.

*Number cooking.*—75.

*Coals.*—160 lbs. per day.

*Present state.*—Good.

*Remarks.*—Require an oven.

*Hospital.*

*Kitchen.*—A 4-feet bar grate, 1 oval boiler; all in good condition.

8 married men's rooms; 2 with grates, 6 with ironing stoves; they are obliged to buy coal from the town at about 6*d.* per room per week.

## ABERDEEN BARRACKS.

Depôt for Infantry.

Constructed for 469.

*Description.*—Two kitchens.

No. 1.

4 oval boilers, iron oven holds 3 tin dishes.

*Number cooking.*—186 men.

*Coals.*—200 lbs. per day.

No. 2.

4 oval boilers. Brick oven does not heat, an therefore not used.

*Number cooking.*—200 men.

*Coals.*—240 lbs. per week.

*Present state.*—Brickwork of No. 1 bad.

*Remarks.*—The flue of the brick oven in No. 2 should be altered, so that it may be easier cleaned, and the sweeps should be oftener employed.

*Hospital.*

Constructed for 35, generally full.

*Kitchen.*—A 6-feet range, a separate iron oven, oval boiler; all in a good state.

*Water.*—Good.

*Coals.*—Inland.

## ABERDEEN.

Beach Battery.

Constructed for 41 artillery.

*Description.*—One kitchen, containing 3 oval boilers, not occupied.

Barrack serjeant's room, excellent range with boiler and oven.

*Present state.*—All new.

*Remarks.*—The three boilers are too many for the men that will be here. Captain Galton's double boiler and oven, with one flue, would be much better, and, in fact, for all low batteries where chimneys are an objection.

A new fort is now being built at Aberdeen, and advantage might be taken of this plan.

## FORT CHARLOTTE, LERWICK.

120 artillery.

Contains no kitchen.

The principal buildings are let to the town for gaol, &c.

The officers' quarters are occupied by the barrack serjeant and master gunners.

*Water.*—Good.

*Coals.*—Scotch and Newcastle.

## STROMNESS BATTERY, ORKNEY.

This is now being rebuilt and armed. Another opportunity here presents itself for the introduction of new boilers with one flue, and if Anglo-American stoves were used in the casemates, one chimney would do for all.

## FORT GEORGE.

Constructed for 1,200 men.

*Description.*—Eight kitchens.

From No. 1 to 8, contain four oval boilers.

No. 9, artillery kitchen, three oval boilers, not occupied.

*Present state.*—Good, except No. 9.

*Remarks.*—These boilers are well set in hard stone. If they should be reset in order to consume less coal, I would still keep the stone setting, with the addition of stone in front instead of brick. I would also recommend a small iron oven in four of the kitchens.

Many of the kitchens are very inconvenient in regard to water; some of the wells are brackish.

*Hospital.*

Constructed for 72, average 30.

*Kitchen.*—6-feet grate, separate iron oven, oval boiler, all well set and good. Sink in kitchen and water handy. Drainage imperfect.

*Coals.*—Scotch and Newcastle.

No married men's rooms.

## FORT AUGUSTUS.

230 infantry.

*Description.*—A kitchen 16 feet by 14 feet, containing a large grate.

These barracks have not been used for some years, part of them are let to private individuals; the remainder is in a bad state of repair, they could be let for an hotel, which is very much wanted here. The tenant to put and keep them in repair, and give them up when required.

*Water.*—Good.

*Coals.*—Newcastle and Whitehaven.

## FORT WILLIAM.

52 infantry.

*Description.*—A kitchen containing 2 boilers out of order.

Part of this building, called the Governor's house, is let to a private individual on lease for 5 years.

The men's quarters are in good condition, but part is very bad. There is only rain-water in tanks.

*Coals.*—Newcastle, Whitehaven.

## DUMBARTON CASTLE.

85 artillery and infantry.

*Description.*—Two kitchens,—

No. 1, 2 large round boilers.

No. 2, ditto.

Unoccupied.

*Remarks.*—No. 1 kitchen is large enough for the number of men quartered here, it only requires an oven.

No. 2 is in a bad state, and can never be used.

*Hospital.*

For 10.

*Kitchen.*—A good grate and boiler, which requires a new flue.

Rain-water ; drainage good.

*Coals.*—Scotch, inland, bad.

GLASGOW.

Constructed for 279 infantry.

*Description.*—Six cook-houses, each containing 5 round boilers set in iron, and iron fronts, except No. 1, which has only 3 round boilers. 1 oven house with brick oven.

*Number cooking.*—200 men.

*Coals.*—1 lb. 4 oz. per head per day.

*Present state.*—Some of the boiler-fronts are cracked, and all are badly set.

*Remarks.*—The coal is very bad, and is found not to be sufficient ; this is owing in a great degree to the way in which the boilers are set ; I would recommend them to be reset, and the boilers lowered six inches, the ash-pit to be sunk and made watertight, and the grate contracted.

*Hospital.*

Constructed for 64, average 20.

*Kitchen.*—A 6-feet grate, iron oven with separate fire, 2 small boilers ; all good.

*Water and drainage.*—Good.

*Coals.*—Very bad.

Recruiting Depôt.

*Description.*—Two kitchens.

No. 1.

4 small oval boilers set in stone ; small iron oven.

No. 2.

5 oval boilers, not in use.

These are new and very little used.

The guard-room for 6 men has a small grate on which they cook.

HAMILTON.

Constructed for 364 infantry and 149 cavalry.

*Description.*—Three kitchens.

No. 1, infantry.

2 oblong boilers set with flush iron fronts like Glasgow, and 22 small oval boilers 9 gallons, set in brickwork, in centre of kitchen.

No. 2, cavalry.

4 oblong boilers set lengthways in iron, like Glasgow.

*Number cooking.*—66 men.

*Coals.*—80 lbs. per day.

No. 3, cavalry.

5 large oval and 1 small boiler set in brick, a brick oven not in use.

*Present state.*—No. 1 requires reconstruction on a different plan with an iron oven. Nos. 1 and 2 good, the oven has not been used.

*Hospital.*

Constructed for 19, average 15.

*Kitchen.*—5 ft. grate, the same as Glasgow; 2 small oval boilers ; all good.

*Water.*—Good.

*Coals.*—Inland.

FORT MATILDA (CLYDE.)

8 guns, 42 men.

*Description.*—A kitchen containing 3 round boilers set in stone ; not in use.

*Present state.*—Very good.

*Coals.*—The allowance is not sufficient ; the coals bad.

A small iron oven should be erected in the cook-house.

Married men ; good stove and oven.

PAISLEY.

Constructed for 241 infantry.

*Description.*—A kitchen with 10 oval boilers set in brick, 5 at each end of the kitchen.

*Number cooking.*—186 men.

*Coals.*—256 lbs. per day, or 1 lb. 6 oz. per head.

*Present state.*—1 stack of 5 boilers bad.

*Remarks.*—To remove two of the boilers from one end, and replace them with an iron oven.

*Hospital.*

Constructed for 32, average 16.

*Kitchen.*—A Flavell, the boiler supplies baths ; everything correct and in good condition.

AYR.

Constructed for 432 infantry.

*Description.*—Two kitchens.

No. 1.

16 small oval 9-gallon boilers.

*Number cooking.*—218 men.

*Coals.*—384 lbs. per day, 1 lb. 12 oz. per head.

No. 2.

The same, not in use.

*Present state.*—Very bad.

*Remarks.*—Requires ovens and new construction.

*Hospital.*

For 40, average 10.

*Kitchen.*—Stove with oven and boiler, all correct and good.

*Coals.*—Inland.

General Resumé ; or, Conclusion arrived at upon the Inspection of the Cook-houses in the preceding Report.

The first object that attracted my attention, even as early as Northampton and Weedon, was the various qualities of coal in those two towns so close to each other, both having the coal from the county of Leicester. The difference was remarkably great ; but the Barrack-master at Weedon told me he intended to have a committee of inquiry upon them.

Having regard to the quality of coal which can only be obtained in these districts, and which will only do a certain amount of work, the nature of the cooking apparatus must to a certain extent be controlled by the coal.

I have therefore arrived at the conclusion :—

1st.—That in most districts brick ovens are unfit for the soldier's use ; they consume too much coal, and are too long and tedious in heating.

2nd.—In regard to *boiling*, in considering the immense outlay that would be required in erecting new apparatus, I recommend that in the majority of cases, the present boilers be reset according to Captain D. Galton's plan, and in all cases with the ash-pit door to hold water.

3rd.—That for casemates Captain Galton's treble boiler be used ; it doing the work of three boilers with one flue, is an advantage in such buildings.

4th.—That directions for the use of the apparatus, more especially as regards fuel, be written and placed in each cookhouse ; as for instance some inland coal requires breaking small and water added to it to make it burn properly ; this is only known by the resident in the place and not by the soldier who comes there a stranger.

5th.—That greater attention be paid to the quality of iron for fire bars.

G. Warriner.

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# REPORT

OF THE

# BARRACK AND HOSPITAL IMPROVEMENT COMMISSION

ON THE

# SANITARY CONDITION AND IMPROVEMENT

OF

# THE MEDITERRANEAN STATIONS.

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**Presented to both Houses of Parliament by Command of Her Majesty.**

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# INSTRUCTIONS.

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War Office,
14th August 1861.

Gentlemen,

In accordance with what I perceive to have been the intention of my predecessor, I have to instruct you to proceed to Gibraltar, Malta, and the Ionian Islands, for the purpose of making an inquiry into the Sanitary Condition of the Hospitals and Barracks.

You are to take for your guide generally the instructions formerly issued to the Barrack and Hospital Improvement Commission.

You will carefully examine the state of the existing Hospitals as respects both size and internal arrangement with respect to the average number of patients to be admitted. You will report your opinion whether any additions to each Hospital are needed, and whether any improvements can be made in the distribution of its rooms.

You will further make any suggestions for the improvement of the Hospital arrangements which may occur to you.

In making your Report, you will bear in mind that the garrisons in the Mediterranean are to be assumed at their existing strength, and that no large grants are likely to be voted by Parliament either for the erection of new hospitals or for the enlargement of the existing hospitals in the Mediterranean.

You will, of course, on your arrival at the stations indicated, report yourselves to the chief civil and military authorities, with a view to their assistance and co-operation in furtherance of the objects of your expedition.

I have, &c.
(Signed) G. C. LEWIS.

Captain Douglas Galton, R.E., F.R.S.,
J. Sutherland, Esq., M.D.

# REPORT

OF THE

# BARRACK AND HOSPITAL IMPROVEMENT COMMISSION

ON THE

# SANITARY CONDITION AND IMPROVEMENT OF THE MEDITERRANEAN STATIONS.

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To the Right Honourable Sir George Cornewall Lewis, Bart, M.P., Secretary of State for War, &c., &c.

Sir,

In conformity with instructions received from the late Lord Herbert, and confirmed by your letter of the 14th August 1861, directing us to inquire into and report on the sanitary condition and improvement of barracks and hospitals at the Mediterranean Stations, we proceeded to examine these stations in the latter part of September and during the months of October and November 1861. We put ourselves in communication with the Officers commanding the troops, Commanding Royal Engineers, Principal Medical Officers, and Civil authorities at each station, from all of whom we received whatever assistance was necessary for our inquiry, besides much valuable information on various points within their several departments. In carrying out our inquiry, we examined minutely the barracks and hospitals, together with the sanitary state of the dwellings of the civil population in their immediate vicinity. We found it necessary for the completeness of our inquiry to call for statistical and other documents requiring time for their preparation, a circumstance which has led to delay in presenting our reports in their present form. But various measures of importance suggested themselves, which were pointed out on the spot. Others were subsequently recommended by us, and our reports on the two most important stations, Gibraltar and Malta, were sent out to these stations as soon as they were completed, in order that practical steps might be taken on them at the time, so that no unavoidable delay has occurred.

In the following report we propose to give, in the first place, a general account of the condition of the stations, with a statement of the principal sanitary defects which came under our observation. We shall next describe the structural improvements required for removing existing defects, with the general principles which ought to be kept in view in executing the works, and the points in which improvements for barracks and hospitals in these climates necessarily differ from those recommended by us for barracks and hospitals at home. We shall then give the detailed reports for each station.

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# PART I.—GENERAL REPORT ON THE STATIONS.

The following is a list of the stations we examined :—

1. Gibraltar.
2. Malta and Gozo.
3. The Ionian Islands, including—

| | | |
|---|---|---|
| Corfu and Vido. | St. Maura. | Cephalonia. |
| Paxo. | Ithaca. | Zante. |

Cerigo we did not visit, for reasons stated in the Ionian Islands Report.*

Considered in their relations to health, all the stations are insular, and the barracks and hospitals are close to the sea, many of them on the sea shore. Dwelling houses in similar positions at home would be considered favourably placed as regards health, and yet very few of the barracks at these stations are healthy. The inmates of some of them have suffered severely at different periods from epidemic diseases, and as a whole they yield a high sick and death rate among the troops.

The climates differ, of course, at each station, but they may be considered as occupying an intermediate position between the climates of England and those of the tropics: generally warm, at times depressing and variable, but not necessarily unhealthy to healthy people, although of such a nature as to add intensity to any local causes of unhealthiness existing at the stations. Malta has the hottest climate, and is more subject than any of the others to the depressing effects of the sirocco.

Gibraltar suffers from the east wind, which occasions physical effects similar to those of the sirocco. But the climate is a fine and healthy one, and yet the garrison has several times been subject to the ravages of yellow fever.

The Ionian Islands, from their close proximity to the mountainous districts of Albania and Greece, have all considerable variability of temperature, influenced by the direction of the winds, and they also experience the effects of the sirocco, debilitating for the time, but not distinctly productive of disease.

There is no marshy ground either at Gibraltar or Malta, and no sources of malaria of any importance, such as those from which intermittent diseases arise. It is different in the Ionian Islands, where improved agriculture and especially drainage appear to have attracted little or no attention. There everything is very much in a state of nature, and even in the immediate vicinity of the principal seat of Government at Corfu there are extensive marshes and tracts of undrained land, such as are rarely met with in the improved districts of western Europe. These act injuriously on the health of the troops; for we find that while periodic fevers are rare at Gibraltar and Malta, they are of frequent occurrence, and sometimes of fatal type, in the Ionian command.

The sanitary condition of the dwellings of the civil population at all the stations is very bad, and it has been impossible in this inquiry to separate the sanitary condition of the troops from that of the civil population. Much, of course, might be done to render barrack rooms more healthy by themselves, but where a bad, unhealthy system of town drainage is intimately connected with the barrack drainage, and where a defective town water supply is necessarily accompanied by a defective barrack water supply, there is no remedy for either evil, as regards the barracks, but to improve the drainage and water supply as a whole, and this can only be done with the concurrence of the civil authorities.

Besides this, at all the stations sanitary defects existing among the civil population place them in constant danger of outbreaks of epidemic disease. The troops are subject to the same general class of morbific causes as the rest of the population, and it may be considered certain that no epidemic can attack the civil population without endangering the health of the troops in garrison.

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* Although recent political events, which have occurred since this report was in type, have rendered any reference to the Ionian Islands stations unnecessary, so far as sanitary improvements are concerned, we have nevertheless considered it to be advisable to include the Ionian Islands, because all the experience which can be obtained in regard to local conditions affecting the health of troops is of importance, and there are some points of interest in which the conditions in these islands differ materially from those presented by the other Mediterranean stations.

At one or other of these stations both troops and people have suffered from plague, cholera, yellow fever, and from severe fevers of other forms, all connected with sufficient local causes.

In all the towns the drainage, especially the house drainage, is in a very bad condition; the domestic conveniences connected with it are of a rude and unwholesome description, or there are none; the water supply is either deficient in amount or not of good quality, and in no instance is it properly distributed for domestic purposes, or connected with the drainage. All defects of this kind which used to exist in the worst districts of unimproved English towns before the days of the Public Health Act exist as the rule in these Mediterranean towns. The dwellings of the poorer classes are of a very inferior description, badly constructed for health, overcrowded, and deficient in domestic conveniences.

In consequence of the intimate relation which exists between the health of the troops and the health of the civil population, we have deemed it to be our duty to give a general account of the sanitary condition of each garrison town, and of the diseases incident to the civil population, together with the principles required for the guidance of the local authorities in dealing with the present evils.

Little or nothing as yet has been done in the way of improvement in these matters at Gibraltar. A good beginning has been made at Malta, and the present enlightened Government has every disposition to grapple with the evils. In the Ionian Islands, although there are municipal authorities, nobody seems to care about the matter, or, at all events, except the water supply at Corfu and Zante, nothing has been yet done to improve the sanitary state of the population.

We have found much requiring improvement, both in barracks and hospitals, at all the stations; we shall give a very general sketch of existing defects, and to avoid repetition we shall lay down the principles we recommend to be kept in view in carrying out the detailed improvements advised in the reports themselves, beginning with the important subject of barrack accommodation.

## 1.—Space per Man in Barrack Rooms.

According to existing regulations, every man should have 600 cubic feet of barrack room space, an amount which, with barrack rooms 10 feet high, would afford 60 superficial feet per man of floor area. This regulation appears to have been framed with special reference to home stations, where there are certain conditions of climate and of barrack construction, which do not exist at foreign stations. The regulation obviously takes for granted that all the rooms to which it is applicable are otherwise fit for habitation; but there are rooms at many stations, especially abroad, to which the regulation cannot be applied, because the favourable conditions which it takes for granted do not exist.

As might be expected, the barracks at the Mediterranean stations vary greatly in local position and construction, as well as in their general sanitary relations. Some few of them occupy airy, healthy positions; they are of good construction, and admit of ventilation and other sanitary improvements. In all such cases we consider that there are no sufficient reasons arising solely out of the climate why the regulation space of 600 cubic feet per man should be much exceeded. Barracks of this favourable character are, however, merely exceptional. In the great majority of cases it would be injurious to the health of the men to adhere to the regulation, on account of the objectionable character of the barrack rooms. In several barracks the regulation space is at present exceeded from this cause.

The casemates used as barrack rooms within the line wall at Gibraltar occupy low, close, damp positions. Some of them are hotbeds of fever, and are not suitable for ordinary habitation. Others of them can only be used with safety by diminishing the number of men, so as to give from 800 to 1,000 cubic feet per man.

At Malta the casemates now affording barrack accommodation to the garrison were never built for barrack rooms. Many were intended for stores, others for places of temporary refuge for women and children in case of siege; others were used as manufactories. The military force in the time of the knights of Malta was distributed all over the islands, and the men lived with their families, except when called out for inspection, drill, or guard duty. There were few barrack rooms in the ordinary sense of the word, and yet all classes of casemates are now occupied by troops. Some of the casemates are so lofty, that if they were allotted at 600 cubic feet per man, nearly the entire floor surface would be occupied by beds, and the surface overcrowding would be excessive. This disproportion between the surface area and cubic contents exists in a

large number of occupied casemates, and in these instances the question of healthy cubic space per man becomes in reality a question of superficial area. Many casemates are in positions where the external ventilation is by no means sufficient for health. Some are partially cut out of the solid rock; others are damp from infiltration of water through the soft porous stone of which they are built.

In allotting the amount of space per man, these various conditions have to be borne in mind.

In the New Pembroke Barrack, recently built on better principles in an airy sea-side position, about three miles from Valetta, 600 cubic feet per man has been given. This should be sufficient as far as space is concerned, but the surface area is too small for the climate: 600 cubic feet per man affords sufficient space in the new huts at Gibraltar, but for all the other barracks at that station other principles must guide the allotment of space. The barracks in the Ionian Islands vary in character like those at the other stations. Some of the casemates in Vido are hardly fit for human dwellings. The more recently built barracks at Corfu admit of being so improved that they can be occupied at 600 cubic feet per man. In the other islands the garrisons are so small, and the positions generally so airy, that most of the rooms fit for occupation might be allotted at 600 cubic feet per man, except in very hot or malarial positions.

Guided by these principles, we have taken each barrack by itself, and after examination on the spot, we have decided on the number of men each room might contain with reference to the local position, superficial area, and possibility of improving the rooms.

We regret to say that the older barrack rooms are, with few exceptions, much overcrowded. Even with all their disadvantages, less than 600 cubic feet per man has generally been given in these rooms; and hence, if the present strength of the garrisons is to be kept up, a considerable addition will have to be made to the barrack accommodation at all the stations.

We have shown the extent of overcrowding, both as regards space and area for each station in the detailed reports, and shall merely give here the general result.

As already stated, the home regulation is 600 cubic and about 60 superficial feet per man.

At Gibraltar the case stands thus. There is regulation space for 5,727 men. Of these, 384 men are barracked in new huts, giving 600 cubic feet per man. The remaining 5,343 have an allowance of space varying from 250 feet to somewhat over 600; but only 63 men have this larger amount. No fewer than 3,617 men have under 450 cubic feet each, and 5,253 men have less than 40 square feet each.

Taking into consideration the position and construction of the barracks at this station, we find that in barracks where the present practice in the garrison would place 5,727 men, there will be wholesome accommodation, after the rooms are improved, for no more than 3,953 men. There is hence a positive want of healthy accommodation for 1,774 men.

At Malta half the troops in the casemates have less than 600 cubic feet, and more than half have under 45 square feet per man.

One of the barracks (Strada Torre), with regulation space for 476 men, is so bad that it cannot be occupied. Deducting this barrack, making allowance for the local position of the other barracks, and the surface area which ought to be allowed in all the rooms, in consequence of their height, including also the New Pembroke Barrack in our calculation, we find the question of accommodation at Malta to stand as follows:—There is regulation space for 6,955 men; there is wholesome accommodation for 5,014 men; leaving a deficiency of room for 1,941 men.

We assume that in comparatively open positions occupied by barracks in the Ionian Islands 600 cubic feet per man ought to be sufficient for health, where the barrack rooms are otherwise fit. Applying this rule, we find at Corfu and Vido that there are 2,494 men barracked in rooms with space for 1,654 men.

At Paxo a barrack hut for 30 men is required, as the present accommodation for 28 men is not sufficiently good, and is damp.

At Santa Maura there is regulation space for 126 men where 96 men ought to be, even if the ground-floor rooms were occupied, which they never should be on account of malaria.

At Ithaca 92 men occupy rooms where 44 should be.

At Cephalonia and Luxuri the regulation number of troops has varied from 654 to 579, in barracks where there is scarcely healthy accommodation for 300 men.

Zante barracks have regulation space for 326 men, or about 100 men more than there should be.

In the Ionian islands there is thus wholesome accommodation for about 2,350 men and regulation space for 3,720, leaving deficiency of room for 1,370 men.

It would hence appear that the Mediterranean stations we examined have, either by regulation or by local practice, barrack accommodation (some of it good, much of it indifferent, and some of it unfit for occupation) for about 16,402 men. That by applying the home scale of 600 cubic feet per man wherever it is possible to do so, and by departing from it as little as possible in barracks badly situated or otherwise incapable of sufficient improvement, there is space for no more than about 11,317 men, leaving a deficiency of space for about 5,085 men.*

This large deficiency can only be met by providing more accommodation, or by reducing the garrisons.

At all the stations there is one period of the year more unhealthy than the remainder. The prevailing diseases at this season are fevers and bowel complaints.

In the absence of sufficient barrack accommodation, we would suggest, as a temporary expedient for preserving the troops from the unwholesome influence of their barrack rooms during the unhealthy months, that as many men as possible be removed out of the crowded rooms and placed under canvas. We have indicated in the reports on the stations the class of barracks in regard to which this measure might be most advantageously adopted, and we recommend that it be made a matter of ordinary barrack administration during such time as the principal medical officer of the station may certify as to its being necessary.

The experience of Pembroke barracks at Malta shows how much benefit might be derived by removing troops from unhealthy casemates if this measure is properly carried out. But the amount of disease which took place among troops under canvas in a badly selected locality close to these barracks, shows the need of exercising care in selecting ground for camping.

## 2.—Additional Barrack Accommodation.

If it be determined that the present garrisons are to be maintained, it will be necessary to provide additional barrack accommodation. If the sites for barracks be properly chosen, and if the buildings be suitably arranged for health, 600 to 750 cubic feet, with from 60 to 75 square feet per man, ought to afford sufficient space for health at almost every Mediterranean station. If in any locality where a new barrack is required there be not sufficient area to erect barracks of hut construction, it would be safe to build barracks containing two floors of rooms. But the simplest form of construction for barracks in warm climates, to ensure the conditions necessary for health, subdivision of men, and good ventilation, is that of detached huts.

Huts of this description have already been built at Gibraltar, where the practice of building is similar to that followed at home. The windows of these huts are, however, too small.

The Maltese population build in a different manner. They have a soft workable stone, which affords great facilities for erecting structures, sometimes arched over to form casemates, or having arched ribs to support ceilings or roofs, or wooden beams are used. The roofs are flat, and stone flooring is universally adopted, to prevent annoyance from vermin.

The barracks in the Ionian Islands are built like ordinary English structures.

Detached barracks can be built at any of the stations, either on one floor or two floors, and can be rendered healthy by attention to the following simple precautions:—

1. The hut may consist of one room for 20 to 25 men, with windows along both sides, and doors at the ends. The window space should be in the proportion of one window to two beds. The beds should be arranged between the windows, with their heads to the wall. The windows should be carried from within about 2 feet 6 inches of the floor to within 1 foot 6 inches of the ceiling, and should open top and bottom. From 20 to 22 feet would be a good breadth for the room. Nine to ten feet would be a sufficient height.

2. In airy positions each man should have at the least 600 cubic feet, and 60 square feet of barrack-room space. This applies to detached hut construction, where the air plays freely round all sides of the hut. But, if rooms be built with two sides only exposed to the outer air, the cubic space and superficial area should be 750 and from 70 to 75 feet respectively.

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* Excluding the Ionian Islands, the barrack accommodation at Gibraltar, Malta, and Gozo would, if improved, be sufficient for 8,967 men, leaving a deficiency to be supplied of healthy barrack-room space for 3,715 men of the present garrisons.

3. Each hut should be ceiled so as to interpose an air space between the ceiling and roof for coolness. If the hut lies east and west, a verandah should be provided on the southern side. If the hut lies north and south, it would be desirable to construct a verandah on both sides, but care must be taken not to obstruct the light too much. A verandah is a great comfort also in wet weather. It should not be less than 6 or 7 feet wide.

4. A non-commissioned officer's room should be placed at the end of every hut, or two huts might be built in line with two non-commissioned officers' rooms between them. These rooms should have 190 to 200 or more superficial feet of floor surface, according to the local position of the barrack.

5. The night urinal may be placed in a porch on the other side of the verandah, opposite the end of the room, in order to be completely cut off from the room, although reached under cover.

6. There should be large-sized louvred ventilators introduced along the opposite sides of the room, between the windows and close under the eaves. A row of ventilating air bricks, carried all round in the same position, would be preferable in situations not exposed to very high winds.

7. Where rooms are ceiled with flat ceilings, louvred ventilating turrets should be placed at intervals, leading from the ceiling of the room to above the ridge, for the purpose of carrying off the foul air. Where the ceiling is carried in the line of the rafters, exit for foul air may be provided by means of a raised ridge. Where there are two floors of rooms ventilating shafts would have to be carried from the ceiling of the lower room to above the roof.

The fresh air inlets would be of the same nature as in single floor huts.

8. The foundation of a hut should never be dug out of the ground so as to leave a hollow space under the floor. But, on the contrary, the floors should be raised three or four feet at least above the ordinary ground level, with a free passage for air beneath.

Space for a hut should never in these climates be obtained by cutting away part of a hill side, leaving a section of earth or rock at no great distance from the side or end of the building. But if this be unavoidable, a clear space of at least 20 feet should be left between the hut and the hill side. The plateau obtained by cutting and levelling should be efficiently drained, so that all the water from the higher ground may be cut off and turned aside from the site of the hut.

All hut sites should be entirely isolated, so that no surface water can find its way under the hut. Wherever practicable, the end and not the side of the hut should face the slope, in order to have the outer ventilation as free as possible, and to interfere as little as may be with the natural fall of the drainage.

9. All barrack buildings in warm climates should be placed so that healthy winds may blow against their sides, rather than against their ends.

By keeping these principles in view, and by selecting ground with a healthy exposure and a good natural fall for drainage, there would be no difficulty in constructing healthy barracks at any of the stations. In such a situation as Sta. Maura fort, where no selection of ground can be made, because it is all too low, the only way is to build the huts in two floors, and to occupy only the upper floor for sleeping rooms.

We have had plans prepared to illustrate different methods of embodying these principles of barrack construction applicable to the Mediterranean stations.

Plan No. 1 shows a plan, section, and elevations of a single barrack hut for 24 men. The floor is raised above the ground with a free passage of air beneath it. The room is 73 feet long by 22 feet wide and 11 feet 6 inches high, affording about 760 cubic feet, and 67 square feet per man. There are 12 windows, 6 on each side, with two beds to each window. The room is ceiled and the walls are built double for coolness and dryness, and they are further protected by a verandah 7 feet wide. Ventilation is provided for by louvred foul air shafts carried up at each end of the room to above the roof, and fresh air is admitted by a continuous course of ventilating brick carried along the opposite sides of the room under the eaves.

At one end of the hut is a serjeant's room 16 feet long by 14 feet broad and 11 feet 6 inches high. This room has a separate entrance door and a small inspection window into the barrack room.

At the opposite end of the barrack room there is a lavatory room, a small room with foot pans, and a compartment to contain the night urinal. These although under the same roof are separated from the men's room by a through and through open passage 6 feet wide, out of which opens the barrack room door. There is no fire-place in the barrack room, as the plan is intended for warm localities, much exposed to the sun. There is a fire-place in the serjeant's room for cooking, if he happens to be a married man.

Plan No. II. shows a double barrack hut intended for a detachment barrack for 32 men at Cerigo.

As in the preceding example the floors are raised above the ground with a free passage of air beneath. Each room is 62 feet long by 20 feet broad and 12 feet high, giving about 78 square feet and 930 cubic feet per man. There is a window for every two beds. The roof is flat, a verandah is carried out straight from the roof. The serjeants' rooms in this example are placed between the barrack rooms. The ablution and night urinal accommodation is at the outer end of each barrack room, and is cut off from the rooms by a through and through passage. It is differently arranged and admits of freer ventilation than that shown in Plan I. In this plan a night water-closet is shown.

The ventilation of the barrack room is provided for by foul air shafts at the ends, and a continuous ventilating course at the eaves.

The station is a very hot and exposed one, and no fire-places are required.

Plan III. shows a barrack in two floors, intended for situations where the available ground would not be sufficient to enable single huts to be built. There are two barrack rooms and two serjeants' rooms on each floor, together with the staircase and passages. Each barrack room is 63 feet long, 20 feet wide, and 11 feet high. It is intended for 18 men at 70 square feet and 750 cubic feet per man. The rooms are ventilated by foul air shafts and a continuous course of ventilating air bricks at the eaves, as in the preceding examples, and they are all provided with ventilating fire-grates, to admit warm fresh air during damp weather. There are verandahs along one side. The ablution accommodation and night urinals are placed at the outer ends, and are reached by passing from the room into a through and through passage having a constant sweep of air passing across it. This arrangement of ablution accommodation would only be necessary in very exposed positions. In all others it might be reached by means of the verandahs, without making use of the door at the end of the barrack room.

There should be no glass in the windows of the stairs and passages. They should always be open to allow the air to sweep freely through the building.

Ventilating fire-grates are required at some barracks in the Mediterranean stations, to warm and dry the air at certain times during the wet season. Where coal is burned, the ventilating grate in use in English barracks (Plan X. Fig. 1) should be adopted. Where wood is used, the form of grate shown in Plan IV. is necessary. It is an open fire-place, the back of which is formed of a double chamber of fire-clay blocks. The wood is burned against the front of this chamber so as to heat it, and the fresh air from without traverses the chamber twice before entering the flue through which it is admitted to the room.

### 3.—Married Soldiers' Quarters.

Except a few Royal Artillery and Royal Engineer huts at Gibraltar, there are no proper quarters for married soldiers at any of the stations. The present accommodation is everywhere of an inferior and bad description. It consists of misappropriated rooms of all kinds, miserable ruinous wooden huts, arches in fortified works, and other similar makeshift places, generally of a character inferior to the dwellings of the lower class of civil population in the vicinity.

It is a matter of urgent necessity that the present deficiency should be supplied by erecting proper married quarters.

We would propose that sites should be selected on similar principles to those for barracks, that the foundations should be similarly prepared, and the lower floors raised above the ground in the same way. One room has been fixed as the allowance for every married soldier, and until all barracks are supplied to this extent the allowance of space should be adhered to. But in making this provision there might advantageously be a few additional rooms, in order to afford a second room in cases of men with large families.

The same rules of healthy construction for this class of buildings are required for the Mediterranean stations as for dwellings of the labouring classes at home. The following are the principles to be kept in view:—

1. Simplicity of construction and arrangement in the block plan, so as to ensure free outer ventilation. This primary condition can be ensured in erecting married quarters in blocks, whether in one, two, or three stories.

2. Each room should have a door and window to the outer air on one side, and a window to the outer air on the side opposite the door. For serjeant-majors' quarters, for which two rooms are allowed, there should be a door and window from the outer air into one of the rooms, a door through this room wall into the other room, which room should have a window to the outer air on the side opposite the outer entrance

door. That is, whether a quarter consists of one or two rooms, there should be doors and windows to the outer air on opposite sides of the building, so that by opening the doors and windows a free current of air can be passed right across the building.

This cardinal principle of construction should never be lost sight of in erecting dwellings for soldiers and for persons of the soldiers' class. It is impossible to afford sufficient cubic space for the adults, and often numerous children of poor men's families, so as to have a residue of air sufficient for health within the rooms. And simple structure, with every natural facility which the architect can give for renewing the air, is the only other alternative. Indeed, we consider it to be a form of construction equally essential for officers' quarters.

3. This principle precludes altogether the arrangement of separate houses on opposite sides of an inner passage or corridor. To apply the principle in its utmost simplicity, single lines of rooms on one floor should be erected. Where blocks of dwellings on more floors than one are required, access to each dwelling should be given separately from an outer terrace, six or seven feet wide at the least, reached by stairs at the ends.

4. Inner stairs should always be avoided in crowded houses, unless the stairs and passages go through and through the building, with windows and doors on both sides. The outside terraced entrance and verandah, as they are used in this class of dwellings at York and Woolwich, are the best arrangements yet made for ensuring the advantages of healthy structure for quarters for married soldiers, and indeed for dwellings for the working classes generally.

5. This primary rule for securing fresh air inside the rooms requires that everything which is likely to foul the air, should be kept out of the house. There should be neither sinks nor water-closets under the same roof with living and sleeping rooms, and having ventilation common with that of the house.

In houses of a higher class, these things can be otherwise arranged, because different habits in the occupants lead them to exercise due care over them, but among soldiers' wives, and generally among women of the poorer classes, no dependence can be placed on the proper usage of any domestic contrivance, however good, in such a way as to prevent mischief. The only safety is to place all water-closets, sinks, lavatories, baths, wash-houses, and cook-houses, out of the buildings, and under a separate roof, connected, if thought desirable, under cover with the dwellings, but having quite separate ventilation.

6. Each single quarter should have 180 to 200 superficial feet of floor area, and double quarters 300 to 350 superficial feet.

Plan V. embodies these principles of construction in a block of building intended for 21 married soldiers in Mediterranean climates. It consists of two floors of single rooms, each of which is 16 feet long by 13 feet 6 inches wide, having a door and window on one side and a window on the opposite side. Both floors have outside stairs, terraces, and verandahs, and the lower floors are raised above the ground with a free current of air below. Each room has a foul air shaft and a row of ventilating bricks close to the ceiling on both sides. In married quarters of this construction there should be double outer walls to keep the rooms cool in summer and warm in winter.

At the larger Mediterranean stations the barracks are scattered over so much ground that the married quarters must be at considerable distances from each other, and instead of building a female hospital it would be better to provide a room attached to each block, into which confinements and cases of sickness might be received for treatment by the regimental surgeon. Such a room, 26 feet long and 16 feet wide, is shown in the plan. There is a small kitchen, or scullery, with a fire-place for heating articles, and a room for the nurse or woman in charge.

Plan VI. shows another form of construction for married quarters in separate huts. It was intended for the small detachment barrack at Cerigo, but is equally applicable to large barracks in climates where detached huts are more healthy than large blocks of building. On the same plan is shown a small guard room and cells with arrangements suitable for Mediterranean climates.

7. A married soldiers' ventilating fire-grate of the approved pattern, Plan VII., should be put up in each quarter.

8. Each room should have ventilating air bricks along opposite sides, as shown in the plans, or in exposed situations a louvred inlet ventilator should be introduced at the eaves, and a foul air shaft should be carried up in the wall, as shown in the plans.

9. The windows should open top and bottom, and should be carried from about 2 feet 6 inches from the floor to within a foot or 18 inches of the ceiling. Verandahs six or seven feet wide are required on the sunny side at all the Mediterranean stations.

10. As it is not possible, in summer, for the families to cook in their own living rooms, each block of quarters should have a cook-house, with a raised brick platform to hold a

small iron, earthenware, or Maltese stone cooking stove, either of which would be quite sufficient for all ordinary purposes, while they possess the advantage of enabling each family to cook with its own fire. This arrangement is shown on Plan V. The water-supply and sink for cooking and washing up should be in the cook-house.

11. Each block should have an ablution and bath room for women and children, and a similar room for men, as in Plan VIII. Two baths and a few fixed wash-hand basins with water laid on would be sufficient for every block of quarters.

12. A Jennings' latrine for women and another for men should be provided. They may be placed adjacent to the ablution rooms in the manner shown on Plan VIII.

13. Each block would require a wash-house for soldiers' washing, with coppers for boiling, fixed tubs, to which cold water should be laid on, and an ironing stove and tables, but drying apparatus would rarely be necessary in these climates. This point should, however, be determined with reference to local circumstances. The washing arrangements are shown on Plan IX. When a drying closet is required the pattern made for the War Department by Messrs Jeakes should be adopted; it is more economical of fuel than any hitherto constructed.

### 4.—Means of Instruction and Recreation.

The means of employing the soldier's unoccupied time are generally insufficient at the Mediterranean stations, although there are one or two establishments well worthy of imitation elsewhere.

Gibraltar has an excellent soldiers' home, with branches, to which the soldier has access when out of barracks; and at Corfu there is a covered gymnasium, also an excellent provision of its kind.

There are a few ball courts and skittle grounds, and the usual soldiers' libraries and reading rooms; but nowhere except at Gibraltar did we find any systematic provision made for affording rational recreation for the soldier. The Mediterranean stations generally, are no worse off in this particular than home stations are. All of them require additional ball courts and skittle grounds, together with gymnasia, and barrack reading, day, and recreation rooms, provided with means of obtaining refreshments, and playing innocent games. But, although the provision of this class of barrack accommodation is no worse, the necessities for it are much greater than at home. The casemates where the soldiers live are not places in which men would choose to spend their spare time. They are by no means sufficiently comfortable, and are not to be compared to good barrack rooms. Almost every barrack should have separate recreation rooms, comfortably constructed and furnished, and very well lighted at night and warmed in winter. At present the soldier, except at Gibraltar, has no resource between a dark casemated room and immoral places of resort, which abound in these garrisons, and which are injurious both to his health and efficiency.

These improvements should be carried out in conformity with the recommendations of the Report drawn up by the Committee on Soldiers' Libraries and Recreation rooms.

Every barrack should be supplied with two rooms, one room for newspapers and books, and for writing letters, the other for smoking, talking, playing games, &c. In connexion with this there should be a small room or bar for the preparation and sale of tea, coffee, ginger beer, bread and butter, &c. A room or quarter for a person to superintend should also be provided.

The rooms should be of sufficient size to allow at least for 25 per cent. of the soldiers in the barracks in which they are situated to occupy them at one time, and 12 superficial feet per man, with a height of from 11 to 14 feet, dependent upon their length. They should have a ventilating grate, regulation pattern of the large size, to every 20,000 cubic feet of space, for which an allowance of coal for about two months in the winter should be issued. The windows should be on opposite sides of the room, carried to within 1 foot or 1 foot 6 inches of the ceiling, and down to within 3 feet from the floor, and at distances of 6 or 8 feet. Inlets for the admission of fresh air, of the regulation louvred pattern, should be placed close to the ceiling in every space between the windows, and shafts for the removal of vitiated air or smoke should be carried up in the walls or through the ceiling to above the roof; the lower part being louvred to prevent any down-draught being felt by the men, and the upper part protected by louvres or otherwise against the possibility of rain passing down. These shafts should have an area of not less than one square inch for every 25 cubic feet of the room, and they should be provided with a valve to reduce the opening by two-thirds in cold weather.

The rooms should be furnished with comfortable benches with sloped backs, settles, arm-chairs, and solid tables; and ample means of lighting them at night should be provided.

Gymnasia should likewise be provided for instructional drill in gymnastics.

The only way to make gymnasia really useful is to build them of a proper size, in sufficient numbers, in convenient localities for the regiments, and having done this to make carefully conducted gymnastic exercises, conducted, we mean, on sound physiological principles, as all drills and exercises ought to be, a special parade.

### 5.—Ventilation of Barracks.

Many barracks in the Mediterranean commands are unfavourably situated for external ventilation. Those within the Line wall at Gibraltar are examples of this defect. Although close to the sea, the rooms face towards narrow closed courts, or spaces between the barracks and the houses of the civil population, while their opposite ends abut against the sea wall. Many of the Malta barracks are similarly constructed: others of them are closely surrounded by houses and buildings cutting off the sea breeze. The large Corfu barracks have the ventilation of one entire side interrupted by the rock against which they are built.

The structure of all the older class of barracks throughout the commands is unfavourable to ventilation. Nearly all are deficient in window space. In barrack rooms, ablution rooms, latrines, cook-houses, in fact, in all buildings, there seems to have been an aversion in the designer to give air and light. In some rooms there are no means either of light or ventilation, except doors and loopholes. In the casemated barracks generally there are windows and doors only at one end. Sometimes the distance between opposite doors and windows, where there are windows on both sides, is too great to admit of free renewal of the air. Sometimes the entire range of casemates communicates by doors through the arches, leading to a community of foul air throughout the structure.

In the great majority of rooms no special means of ventilation have been provided.

In a few barracks foul air shafts have been lately introduced, generally too small and without inlets for fresh air; in a few rooms there are shafts with inlets for fresh air, the latter recently supplied. In some instances there are openings near the ceilings, but no foul air shafts. In only two instances, namely, in the Pembroke Barracks, Malta, and in the new huts at Gibraltar, has a suitable provision for ventilation been made in the construction, and in the latter the window space is too small.

Taken as a whole, the Mediterranean barracks require ventilating arrangements even more than was the case formerly with barracks at home.

In dealing with this important subject, it is necessary to bear in mind that good ventilation in warm climates does not mean simply the passage of a certain amount of air per man through the rooms, as is the case at home stations (where 1,200 cubic feet of air per man per hour are provided), and further, that except in special cases, the question of ventilation is not complicated as it is at home, by reason of the question of warmth being so closely connected with it.

The absence of fire-places must also be taken into account in introducing ventilating arrangements, and larger ventilating shafts must be provided to supply the want of a heated chimney flue.

The element of high temperature everywhere gives greater activity to any local causes of unhealthiness, and amongst the most important of these causes at the Mediterranean stations must be ranked the exhalations from the breath and bodies of men crowded together into barrack rooms. If an atmosphere charged with these emanations is allowed to remain stagnant in such climates, sickness may at any time ensue, even although a certain measured amount of air be introduced at one end of a room, and be drawn off at the opposite end.

In all ventilating arrangements for use in warm climates, provision should be made for constant movement of the air through every corner of the barrack room. But in barracks placed in close situations, and constructed in the defective manner we have described, this is difficult to accomplish.

The principles we recommend to be followed in this matter are:—

1. To remove, wherever practicable, any external obstruction to the circulation of the air, such as useless buildings or old walls, so as to secure as free a movement of air as possible round the barrack.

2. To ventilate each barrack room by itself and independently of every other room, and in applying this principle to close up all communications between adjacent barrack rooms.

3. To enlarge all windows having an area too small in comparison to the cubic contents of the barrack room; to open new windows in dark corners, in gable ends, or

under the crowns of arches near the tops of casemates, and to increase the window space where practicable by providing windows on opposite sides of the rooms; to enlarge loop-holes into small windows, and to provide them with loop-holed iron shutters to be closed in case of need. The barrack room window space, including the additions made to it, should equal one square foot for every 50 to 55 cubic feet of contents of the room.

The carrying out of these alterations will of course be subject to considerations of defence. But wherever they can be made they will improve the healthiness of the rooms.

4. In casemated barracks, more especially in those at Malta, to study carefully the directions of air currents outside the rooms, and to make the inlets for fresh air in such positions as to take advantage of these currents. Such inlets should be generally of the dimensions hereafter stated.

5. In addition to fresh air inlets, to introduce shafts of the dimensions hereafter stated, for removing foul air from the top of the room. In casemates these shafts would have to be carried up in the most convenient positions afforded by the structure of the works.

6. The shafts should all be louvred above and the louvres protected to prevent rain beating in, and also below, to throw any chance down currents of air towards the ceiling. There should be a valve at the lower end, held in its place by a cord, so as to be allowed to fall open for cleansing the shaft. The method of louvring is shown in Plan X., Fig. 2. In the report on Malta we have recommended Muir's four-sided louvred ventilator as being most suitable for the peculiarities of the climate and the local position of many of the casemates. This ventilator should also be louvred at the lower end. If soldiers feel down drafts they will infallibly stop up the openings from whence they come.

The best inlet for fresh air in existing barrack rooms is a grating of large size with a louvre into the room, having the blades so arranged as to throw the inflowing air up towards the ceiling, and capable of having half its sectional area closed in cool weather, as shown in Plan X., Fig. 2. For new barrack rooms in close warm positions, the best inlet is the continuous ventilating course at the eaves already described.

7. The most desirable places for foul air shafts and inlets for casemated rooms depends on the nature of the casemates.

In long casemates with windows and doors at opposite ends, the best place for the shafts is about the middle of the length of the casemate, and in such cases the inlets for fresh air should be placed at each end over the doors and under the crown of the arch. This arrangement is shown in Figs. 1 and 2, Plan XI.

In casemates with one of their ends against a dead wall, the shafts should be carried up from the crown of the arch close to this wall, and the inlet should be placed at the opposite end over the door, under the crown of the arch, in the manner shown in Fig. 3, Plan XI.

Where there are two floors of casemates so constructed that separate ventilating shafts cannot be made for each floor, the lower floor may be ventilated by carrying a short shaft from the crown of the arch into one of the loopholes of the casemate above. If this loophole were glazed with thick glass on its inner side it would still admit light to the upper casemate, although acting as a ventilating shaft to the casemate below. The arrangement is shown in Plan XI., Fig. 4.

In large casemates in very confined positions more than one shaft may be required.

Where the men's accommodation consists of barrack rooms of the usual construction in floors, the shafts should be carried up in the most convenient positions beside the division walls, and the inlets should be placed in the opposite sides of the room, over the windows, or as high up as possible between them.

In the upper floors of existing barracks and in existing barrack huts, when the ceiling follows the line of the rafters, the best ventilation is afforded by a louvre carried along the ridge, with inlets on opposite sides under the eaves. But where there is a flat ceiling, a louvred turret and shaft of the construction shown in Plan X., fig. 2 should be introduced, together with opposite fresh air inlets.

8. For the Mediterranean stations the dimensions of shafts and inlets should be *at the least* as follows, subject to such increase of dimensions as the local position of the barracks may appear to indicate as necessary.

(*a*) For all casemated barracks on a single floor the sectional area of the foul air shaft or shafts if there be more than one, should be equal to one square inch for every 25 cubic feet (at Malta for every 20 cubic feet) of contents of the room. The aggregate area of the fresh air inlets should be one square inch for every 30 cubic feet of contents of the room.

(*b*) For all upper rooms of casemates or of ordinary barracks, where the accommodation consists of more floors than one, the sectional areas of shafts and inlets

should bear the same proportion to the cubic contents, namely, one square inch to 25 cubic feet for shafts and one square inch to 30 cubic feet for inlets.

(*c*) The dimensions of shafts and inlets for rooms in the floors below the upper floor should be for shafts, one square inch to 30 cubic feet of cubic contents, and for inlets one square inch to 30 cubic feet of contents.

The sectional areas of all existing shafts and inlets should be enlarged to these dimensions.

9. It will increase the efficiency of all ventilating shafts, both of those which already exist, and of those to be introduced, if they be carried as far as they conveniently can be above the roof of the building or casemate. Ten or twelve feet above the roof would be a desirable length for each shaft.

In the reports for each station we have endeavoured to state how the ventilation should be carried out, but the problem is so difficult on account of the various positions and constructions of the barracks that all we can do is to lay down general principles to be applied in each case according to circumstances. We are of opinion that very nearly all the barrack rooms which are otherwise fit for habitation can be sufficiently ventilated if due care be taken; but to ensure satisfactory ventilation it will be necessary to watch the results obtained in each case, and to make additional fresh air openings in favourable positions if necessary, until the air is found to be sufficiently pure by night as well as by day.

By the new Medical Regulations, medical officers are charged with the duty of reporting on this subject.

## 6.—Warming of Barrack Rooms.

Warming is rarely required for barracks at the Mediterranean stations. Practically it would not be necessary to provide for this contingency, but fire-places are required for dryness during the rainy season in casemated barracks situated in low, damp localities. Some casemates, especially those along the line wall at Gibraltar, are nearly as damp in the rainy season as underground cellars are at home, and stand in urgent need of proper fire-places with ventilating fire grates to be used during the wettest months.

Where coal is used, the ordinary ventilating grate in use in English barracks, Plan X., Fig. 1, should be adopted for existing barracks. Where the fuel is wood, a modification of the ordinary warm air grate suitable for burning wood, shown on Plan IV., already described as applicable to new barrack rooms, should be adopted.

## 7.—Drainage.

A bad state of the drainage is one of the principal defects at all the stations. This is partly due to the absence of sewerage altogether, partly to defective construction of the drains; to the want of a water supply in combination with the sewers, and partly to the condition of the drainage outlets. In almost every instance, except where barracks are removed from the civil population, the drainage defects are common to the towns and barracks. This fact renders it much more difficult to remedy the evils in the barracks than would otherwise be the case. All that can be done at present in most instances is to make the drainage within the barrack boundary as complete as possible, and to look for further improvements in the general system, to the co-operation of the civil authorities.

At Gibraltar, considerable drainage works have been carried out since the last epidemic yellow fever of 1828, but the sewers of the higher parts of the town have very steep inclines, and lead into sewers in the lower districts, where there is very little fall, and as no system of water supply has yet been provided in connexion with the drainage, the mains in the lower levels are liable to become obstructed by deposit during the long dry season, and the first heavy rain bursts the sewers, sometimes washing out their contents close to the barracks in the lower levels. There is besides no proper system of house drainage connected with a water supply. All filth is thrown down these sewers, where they exist, and left to ferment and generate foul air among the houses until the drains are washed out in the rainy season. At Gibraltar the outlets open on a shallow tidal beach, and create great nuisance.

Before we went to Gibraltar, it had been proposed to remedy the liability to bursting of the drains by constructing a catch-water main drain, for intercepting all the sewage from the higher part of the town, and for conveying it into deep water at the Ragged Staff. This intercepting sewer, with improved outlets for the sewers in the lower flat part of the town, will remedy the chief constructive defects of the present system, but after all is done, the condition of the house drainage, and the absence of a water supply, will keep the sewers in an unwholesome condition until these defects are remedied in the

manner we have pointed out in the report. This subject is of great importance, as there is a large body of troops barracked in casemates at the lowest levels in the town, besides those in the barracks situated among the houses, and these latter are exposed to the influence of bad drainage equally with the civil population.

At Malta the town drains are of a most disproportionate size to the amount of water they have to remove. They are defective in form and material, and most of the outlets are offensive. Some of the worst of them open into the tideless harbour close to the general hospital and to barracks, creating nuisance in the vicinity.

The barrack drains about which we have been able to obtain information are very much too large for any possible amount of water they are likely to receive. Deposits are formed in them in consequence, and much nuisance arises in dry weather. All the Maltese drains are made of very porous sandstone, which absorbs water rapidly. Some drains are as much as ten feet deep by two feet wide, in cases where a nine-inch pipe would in all probability carry away the entire barrack drainage and rainfall with ease.

There is no connexion at present between the water supply and drainage in this garrison, and the house drainage is nearly in as bad a condition as it is at Gibraltar.

There is no drainage at Corfu worthy of the name, except that immediately connected with the barracks. The town drains are mischievous to health, and the principal outlets are in shallow water, causing great nuisance and also sickness in one of the barracks. Very few of the houses are drained, and cesspool matter lies on the surface gutters of the streets. The chief defect, so far as the Corfu barracks are concerned, is in the outlets, which are not carried out into deep enough water.

The drainage in all the other Ionian towns where there are troops, is in a similar condition.

The barrack drainage at the stations is very defective, but it is better in Corfu barracks than at other Ionian Island stations, because several of the buildings in Corfu are of recent construction, and more attention has been paid to this detail.

The following are the general principles which should be adopted in dealing with this important matter:—

1. It is indispensably necessary that water supply and drainage should be connected as parts of one system. Without this, any form of covered drain is nothing but a cesspit, and it would be better for the public health that there should be no underground drains, unless there is sufficient water laid on to keep them free of deposit.

This rule applies to all barracks, hospitals, towns, and dwelling-houses at these stations.

To enable this much required improvement to be carried out at Gibraltar, a water supply must be provided for the town dwelling-houses, in the way we have pointed out in the report. Every barrack and the hospital must also have water laid on at pressure from a tank or main, for all purposes, and all the waste water must be discharged into the barrack drains to keep them clear.

At Malta, where there is an aqueduct water supply besides extensive tankage, water must be laid on for all purposes in barracks, and for household purposes.

The water supply for barracks is already connected with the drainage at Corfu. At Zante it is not. At Vido, Paxo, Santa Maura, Ithaca, and Cephalonia the water supply is deficient, not distributed as it should be, and it is not connected with the drainage.

For Zante Town barracks water should be laid on so as to cleanse the sewers; at Zante Castle barracks, and at all the other stations, water requires to be raised and tanked at a sufficient elevation to admit of easy distribution in connexion with the drainage.

2. In every instance where the barrack drainage is not well known it should be examined, described, and entered on a plan. A similar requirement is necessary for house and street drains.

3. Improved dimensions and forms of sewers and drains should be introduced where no drainage at present exists; existing sewers should be re-laid by degrees on the same improved principles. The best form of street sewer is that like the section of an egg with the small end downwards. For barrack or tenement drainage there are few cases, if any, where a nine-inch pipe would not convey all the sewage to the mains.

Wherever pipe drains are used, they should be laid in very carefully prepared solid beds, to prevent bending in any part of the line, which would make the drain worse than useless; and the joints should be made water-tight. All drain pipes should be laid in straight lines, a method which enables them to be easily examined by manholes placed at the angles of junction, and obstructions to be removed. Recently pipes have been made so as to admit of being opened for removing obstructions without destroying the pipe.

4. All the Mediterranean stations have sewer outlets to the sea. These outlets are all defective at present, and give rise to nuisance, partly because the outlets are not constructed on good principles, and are destroyed by the sea, partly because they open into shallow water close to the shore.

The best way to remedy this defect would be to complete the outlet by an iron pipe carried out far enough to enable the sewage to be diluted in a sufficient body of water, and to terminate the outlet by a drop, or by a T head, with its mouths turned away from the direction in which the force of the waves comes, in order to prevent the waves from injuring the outlet, and their impetus forcing foul air up the sewers inside the town.

5. All main sewers and drains should be ventilated by tubes carried up from the summit level to above the top of the houses. A perforated box of charcoal placed over the opening of the tube and protected from wet would destroy much of the noxious matter in the sewer gases before they escaped into the air.

6. All gully grates in streets, courts, and barrack squares should be carefully constructed and trapped. Where water traps are used, it is necessary to supply them with water during the dry season, otherwise the traps will cease to exist, and the sewer gases will be poured into streets, courts, and barrack yards.

7. Sewers and drains, if properly constructed, of sizes adjusted to the levels and to the quantity of water they have to convey, should require no flushing. But unless these conditions be attended to, the main lines should have the means of being flushed out occasionally by a head of water. At the Mediterranean stations this precaution would be most required during the dry season.

## 8.—Water Supply.

At Gibraltar the water supply for troops and for the civil population is obtained from rain-water tanks and from wells either within the fortress or on the Neutral Ground.

At Malta all the barracks have rain-water tanks, as also the houses of the civil population. There are besides these sources, two aqueducts; one of considerable importance which conducts spring water a distance of eight miles to supply Valetta. The other is a much smaller conduit which conveys a small quantity of water to the towns on the Cotonera side of the great harbour.

These aqueducts supply fountains, gardens, &c., and also the rain-water tanks when the rain-water supply begins to fail.

The town and barracks at Corfu have a supply brought by pipes from the country, and laid on for several purposes. The barracks at Vido and those in all the other Ionian islands are dependent on wells and rain-water tanks. The town of Zante has a pipe supply, but it is not laid on to the barracks.

So far as amount is concerned, the Corfu barracks are the best supplied, and those at Gibraltar are the worst. Indeed this garrison is always on a small water allowance, as if it were in a state of siege.

The supply at Malta is apparently sufficient for every purpose were it properly distributed.

The general quality of the water as shown by chemical examination at Gibraltar and Corfu is inferior or bad. The well water at Gibraltar is unfit for domestic use, on account of the wells being polluted by infiltrations from the foul subsoil, charged with sewage and cesspool matter, on which the town is built. The tank water is tolerably good if care be taken to prevent impurities entering the tanks, and if they be cleansed annually. But all tanks require filters of the kind we shall presently describe, to free the water from impurity before it enters the tank.

The only approach to a good system of distribution of water to barracks is at Corfu. At every other station the method of distribution is most objectionable. The water is raised from wells or tanks by hand labour with ropes and buckets, and carried to the place where it has to be consumed. The cost of this process at Gibraltar is equivalent to a water rate of 3,000*l.* a year chargeable on a civil town population of less than 14,000, and to a rate of 500*l.* a year charged on the troops.

At none of the barracks in Gibraltar, Malta, or the Ionian Islands, except at Corfu, is water laid on for any purpose. All has to be carried by hand labour, for drinking, cooking, cleansing, ablution, and washing of linen, and this in a climate where the greatest inducements and facilities should be held out for the exercise of cleanliness and temperate habits.

The present condition of the water supply is a chief defect at all the barracks with very few exceptions.

In the fortresses it is necessary to have tanks for use during siege; but it is possible

to incorporate the use of tanks with a good system of water distribution. The tankage at Malta including recent additions would be about sufficient for a siege supply, but, taking into account the present manner of distribution, it is not sufficient for every-day purposes. The aqueduct supply if added to this would, however, be sufficient if the distributing apparatus were improved. What is chiefly wanted for the barracks and hospitals at Malta is that water be constantly laid on by means of pipes to ablution rooms, baths, cook-houses, women's wash-houses, &c., and also to drinking fountains, from distributing reservoirs to be supplied from the aqueduct, or from iron cisterns at a sufficient elevation, to be filled from the rain-water tanks by force pumps.

Drinking fountains supplied with pure, cold, filtered water are an absolute necessity at all barracks. Any tank for the supply of drinking water to fountains should be protected from heat.

In the Malta report we have stated generally the principles on which we consider that the aqueduct water could be redistributed with most advantage both for the civil population and for troops.

The water supply at Corfu, although sufficient in amount is so inferior in quality that it is necessary to seek for some purer source as near as possible to the commencement of the present aqueduct. The springs now used are really mineral waters, containing a considerable quantity of plaster of Paris in solution, derived apparently from beds of this substance in the subsoil from which the water comes.

At all the smaller Ionian Island stations, raised tanks supplied by force pumps are required, to enable the water to be properly distributed for use. At Ithaca an abundant supply of water might be obtained by an arrangement with the local authorities, from the source described in the report. At Cephalonia it is possible that a better supply than the present rain-water tanks afford, might be obtained from the high ground behind the barracks. At Zante, the town water requires to be laid on for use. At the smaller Ionian Island stations a considerable annual outlay has to be incurred by the commissariat in carting or carrying water to the different barracks on account of impure quality or deficient amount of the present supply.

The most difficult question as regards water supply is that of Gibraltar, because the source is limited by the extent of the ground. We had samples of water from all available sources analyzed, and all were inferior in purity to the tank water derived from rainfall.

Two large tanks for collecting the surface rainfall were being constructed at the time of our visit, one close to the Moorish Castle, the other between the town and the south end of the rock. A proposal had been under consideration for making use of a wide, deep, natural gulley at Buena Vista as the site of a large storage reservoir.

After mature consideration we determined to recommend that this work should be executed, and we have proposed to supply the reservoir by catch-watering the higher part of the rock and conducting as much as possible of the rainfall to the reservoir, whence it might be laid on to nearly every house and barrack on the rock by gravitation.

But the surface area from which it would be possible to collect water in this way is limited, and it is very doubtful whether the amount of water collected would be sufficient for all purposes, military and civil, even with the addition of the supply which would be afforded by the other two tanks already mentioned, and by the existing tanks of houses and barracks. We have therefore recommended a brackish or salt-water supply for flushing sewers and for house water-closets and latrines. By this arrangement the house drains and latrines will be kept clean, and the sewers will be easily flushed out in summer when necessary.

We have also recommended salt or brackish water for some barrack latrines in Malta, where fresh water may not be procurable in sufficient quantity. In using salt water, it must be kept in view that it decomposes very rapidly when in contact with organic matter at a certain temperature, and that there will be nuisance unless the latrines are discharged with due frequency.

We propose that all improvements in the water supply should be made in concert with the local authorities at the different stations, the War Office bearing its proportion of the cost for the troops. Wherever new works are required, whether of supply or of distribution, they are equally necessary for the military and for the civil population. The defects at present bear equally on all parties, and no work of a general nature is required for the garrisons, which would not confer equal and perhaps greater benefits on the inhabitants.

The question of water supply may be summed up as follows:—

1. At Gibraltar there is great deficiency of water for troops and people. The present method of supply and distribution is rude, inefficient, costly, and the quality inferior, or

bad. The rainfall on the rock affords the best future source of supply, and it should be collected in reservoirs, and distributed for use. But salt or brackish water is required for drainage purposes, because a sufficient amount of fresh water cannot be obtained. The cost to be jointly borne by the civil population and by the War Office.

2. At Malta the quantity of water is sufficient, but the aqueduct supply requires to be better distributed, in order that the house-drainage may be improved.

3. At Corfu the quantity is sufficient, the quality bad, but the supply, such as it is, although not used by the civil population for house drainage, is laid on to the barracks.

4. At all the other Ionian Island stations the present supply is deficient in amount.

5. Except at Corfu there is no barrack in the Mediterranean commands in which water is laid on. The method of distribution employed is that usually adopted for temporary camps rather than what is required for permanent barracks, and, as a consequence, there is absolute deficiency of water for cleanliness and for drainage. These defects can only be remedied by providing suitable raised distributing tanks, to be supplied with water by force pumps from existing underground tanks, or from pipes, when, by improvement in the supply and distribution of the water for the civil population, a supply by gravitation becomes available. Water from these raised tanks to be laid on for use all over the barracks.

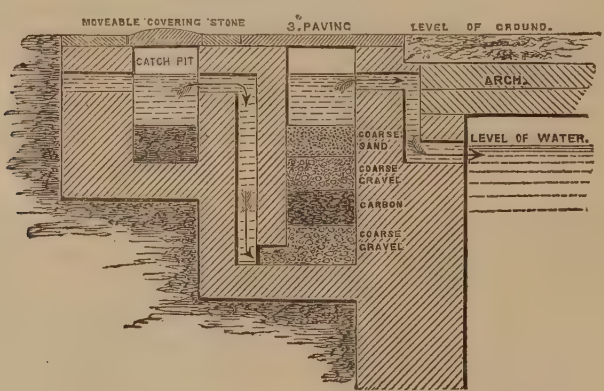
6. We recommend that drinking fountains be introduced in all barracks.

7. Wherever at any of the stations water is not filtered, we recommend that, where rain water has to be stored, it should be passed through a downward and upward filter, consisting of gravel, sand, and charcoal, before it is allowed to enter the tank.

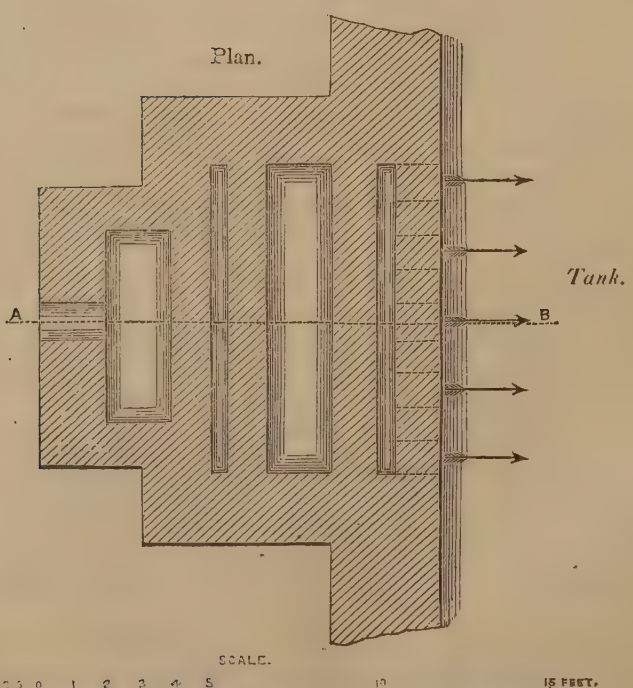
The form of filter we propose for this purpose is shown in the following Figs. 1 and 2.

FIG. 1.—DETAIL OF SINGLE FILTER FOR RAIN-WATER TANK.

Section on Line A.B.



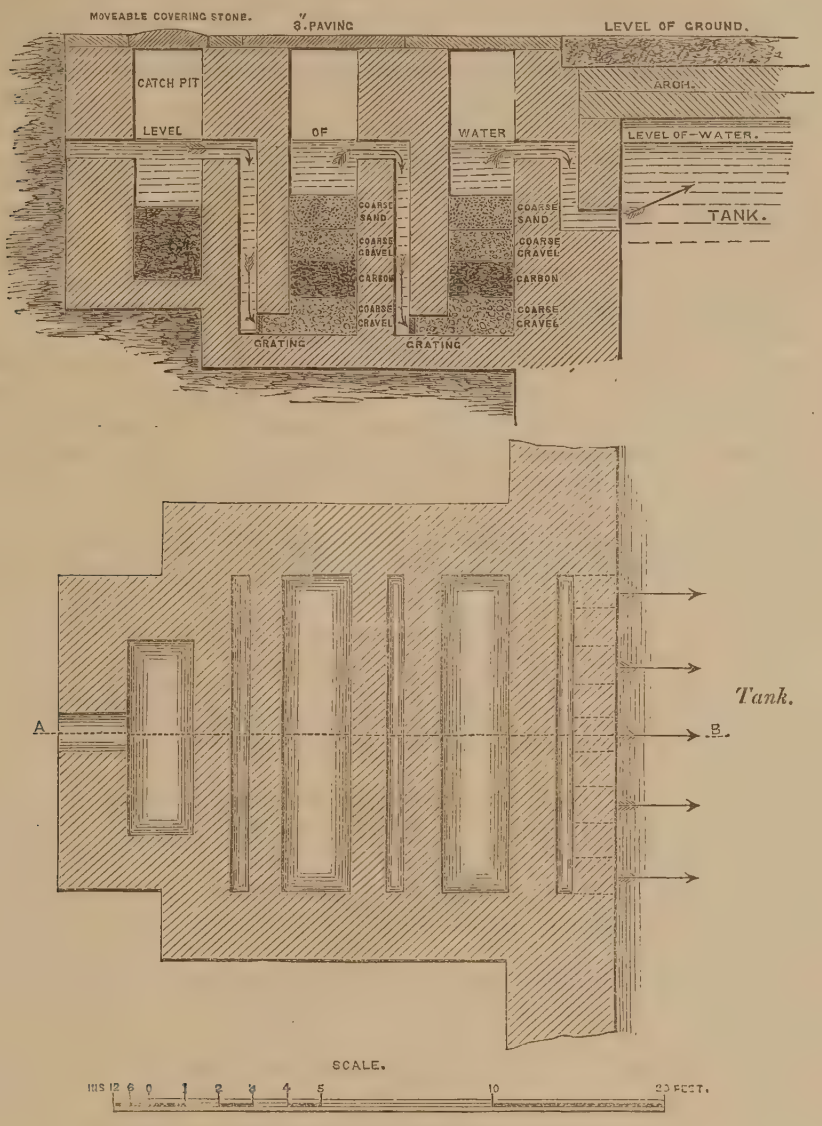

Plan.



The size of the filter must of course vary with the quantity of water to be passed through it. A double filter, as shown on Fig. 2, is sometimes desirable. Care should be taken to cleanse the filters periodically.

FIG. 2.—DETAIL OF DOUBLE FILTER FOR RAIN-WATER TANK.

Section on Line A.B.




## 9.—LATRINES AND URINALS.

We found the latrine accommodation very defective at nearly all the stations, both for barracks and hospitals. Except at the New Europa huts at Gibraltar and at the New Pembroke barrack, Malta, none of the recently improved latrines had been introduced. The usual arrangement for latrines at a short distance from the sea, both for barracks and hospitals, is that of a trough communicating with a drain, which is only a cesspool having open ladder seats over it. There is no water supply. The only cleansing is effected by throwing waste water into the trough. Where the latrines are nearer the sea there is usually an opening into which the sea washes. In one or two instances the latrines are over the sea. At Malta there is a latrine in use which is common in the island. It consists of a long shelving trough of porous stone, having an opening into a drain at its deepest end. This opening is closed by a stick, the end of which is shaped like a ball. Water is supposed to stand in the trough, and to be discharged by lifting the stick; but it generally escapes on account of the bad construction of the valve. There is sometimes no water laid on, and what is used for cleansing has to be carried by hand. In cases where water is laid on, it often trickles slowly into the latrine, and affords no means of thorough cleansing. The practical result is that these latrines are universally offensive, and that much nuisance arises from them.

We propose to supply all the barracks with latrines on one or other of the following Plans.

Plan XII. shows the form made by Mr. Jennings, and which has been recently introduced and found to answer at a number of barracks. It consists of a horizontal cast-iron pipe communicating with the barrack drain, having a number of earthenware soil pans opening into its upper side. There is a water tank above, from which water is supplied by pressure to each pan and also to the horizontal pipe. There is a discharge valve with an overflow to keep the water at a proper level. By raising this valve, the contents of the latrine are discharged, and there is a simple arrangement whereby a forcible stream of water is projected round each pan and through the pipe to cleanse them. The water then resumes its level, and the latrine is ready for use.

It resembles an ordinary water-closet in appearance, and requires a very small amount of water to keep it clean. It should be discharged once or oftener every day, according to the season and the number of men in the barrack, to prevent nuisance from it.

This latrine is well adapted for hospital use where the water supply is too limited to enable the ordinary water-closet to be introduced, and in climates where a patient can traverse a distance of a few feet under cover, but in the open air.

Another latrine, which has been found efficient in practice for barracks, is that made by Mr. Macfarlane of Glasgow. It is shown in Plan XIII.

The apparatus consists of a continuous iron trough having a discharging valve at one end, and a water supply at the other. There are seats, with divisions and doors as in the other form of apparatus, and the discharging and refilling are done in a similar manner.

This latrine has been successfully introduced into a considerable number of barracks, but it is not so well adapted for warm climates or for hospital use as the other on account of exposing a larger surface of water.

In the Mediterranean barracks with few exceptions, the latrines can be drained to existing outlets. But there are instances, as at the Polverista Gate barracks on the Cotonera lines at Malta, where there is no outlet for the drainage, and much nuisance arises from the cesspits in use.

This we propose to remedy, at least until an outlet can be obtained, by discharging the latrines into a raised iron tank, from which the matter may be drawn off at stated periods into a water-tight cart and removed to the sea, or used for manure, which would be very much better. With such a climate and soil every particle of organized matter has its value as a fertilizer.

With few exceptions the latrine buildings are deficient in light and in ventilation. Those of them which occupy casemates are all dark and very offensive. Every additional square foot of space for light and air which the structure will admit of should be given. Detached latrine buildings should be ventilated and lighted through the roof. There should be ventilating openings in the walls, and a large louvre carried along the entire length of the ridge.

In every instance in which the improvement can be introduced without interfering with light, ventilation, and cleanliness, there should be divisions between the seats and half doors.

The floors should be flagged and properly drained and channelled, wherever improved flooring is required.

Whatever form of latrine may be used, attention should be bestowed on its efficient working and cleanliness. Regular cleansing and filling the apparatus with water are necessary in every case, and the regiments should be required to see that this is done. Even at home, and with the best arrangements, neglect of so simple a precaution frequently entails nuisance.

Urinals.—None of the barracks are provided with good day urinals, and the only instance of the introduction of night urinals we met with was in the New Pembroke Barracks, Malta. In this instance, although the position is good, the material used, namely, soft porous stone, is unsuitable, and the result is bad.

Barrack day urinals are generally a trough of stone more or less porous. They are not supplied with water for cleansing, and all are very offensive.

For these climates day urinals should be made of impervious material. Slate would answer sufficiently well. It should be carefully joined at the angles, and the floor well channelled and drained. Where water is so scarce as it is at these stations, it would be impossible to lay water constantly on for cleansing, but a water supply could always be provided at hand, for the urinal to be cleansed daily by hand labour. This, like the cleansing of the latrine, should be made a part of the daily barrack cleansing. Urinals should never be placed under the same roof as the latrine. They should be in the open air, with simply a roof and a sufficient screen; and they should always have a separate drainage, and never into the latrine. Any oversight in this matter will increase greatly the nuisance both from latrines and urinals.

On Plan XIII. is shown the construction of a day urinal of slate, placed in front of a set of Macfarlane's latrines. It consists of a sloping back of slate, with vertical slate divisions 2 feet 6 inches apart. The construction is simple, and admits of easy cleansing, but this urinal exposes a large surface to the air.

To obviate this disadvantage, and to economize water, Mr. Jennings has made a day urinal in which water stands at a constant level, regulated by an overflow pipe and water valve. A small stream of water flows into the basin from a supply pipe, so as to dilute and carry away the contents of the basin, and to prevent the deposit of urea. An elevation, plan, and section of this urinal are shown in Plan XIV.

Great difficulties exist in providing night urinals for the present barrack rooms at these stations, where this class of accommodation is even more required than at home, on account of more rapid decomposition and the stagnant condition of the air, caused by higher temperature of the climate and the casemated construction of the rooms.

Wherever there is an unlimited supply of water, and suitable space, barrack room urinals can be constructed, but in the existing Mediterranean barracks, both of these elements are deficient.

In most cases it is difficult to find any space in which to construct a suitable recess for night urinals, and in every instance there is not sufficient water to enable urinals with water continually running through them to be made use of.

Only one form of apparatus has yet been contrived in which the advantages of a water supply are to any extent secured, with due regard to economy of water. It is an earthenware urinal constructed by Mr. Jennings, somewhat resembling a small water-closet, with a trap, plug, supply pipe, and overflow. It is shown in Plan XIV.

When in use it is filled to a certain level with water by raising the handle and letting it drop. A body of water is thus obtained for purposes of dilution, and any addition made during the night to the contents, passes off diluted by the overflow pipe. In the morning, the person in charge lifts the handle and the contents escape by the pipe. A stream of water washes the whole surface, and by using a brush at the same time, the urinal can be washed clean. On dropping the handle, the water rises to its level, and the apparatus is ready for use.

This urinal, with proper care in cleansing, can be kept sufficiently sweet to enable it to be placed in any small compartment, which can be constructed for it out of any ordinary barrack room. The compartment requires a swing door, to be locked during the day, and a window direct to the outer air, with sufficient ventilation. The floor of the compartment should be of slate, with a wooden grating or board for the men to stand on, which should be well washed every day and renewed when it becomes offensive. Wherever practicable, it is better to place this urinal in a small compartment separate from the barrack room, to be reached by a step or two in the open air, but under roof cover. This could be done without risk in these climates. Many barracks are more or less overlooked from the houses of the civil population, and in constructing any detached urinal accommodation, it would have to be done with reference to this fact. Each case will have to be carefully considered on the spot, because the position of night urinals for existing casemates, with due regard to cross ventilation, decency, and access under cover, is almost as difficult a problem as constructing a urinal.

There is one point in the construction of urinals which has been recently much insisted on as affording a means of cleanliness for the men, and in this way diminishing their liability to venereal affections. This is to place over each urinal a small water tap at a convenient height. We consider that this improvement is well worthy of a trial, and we would recommend its introduction.

Wherever a separate porch with a cross ventilation between it and the barrack room door can be obtained, a urine tub lined with pitch might be used instead of the water urinal. At Pembroke Barracks, Malta, the urinal is in such a porch. The Pembroke barrack rooms have doors and windows at opposite ends, and the porch is placed opposite one of the doors, so that the other door is free. But where the casemate has only one door with windows beside it, there might be risk of injuring materially the ventilation of the room by placing the porch opposite the only door. The best place for it in these cases apparently would be to one side of the door, provided it could be reached without the men being seen from the outside.

If the side windows of adjacent casemates were partly converted into doors, leaving the upper part glazed as at present, and if the porch were placed between the casemates, this would probably be the best arrangement under the circumstances.

One porch would thus answer for two adjacent casemates. It should consist simply of a screen wall with a sloping roof, leaving an open space of a foot all the way round between the roof and the top of the wall. It would have to be divided up the middle into tw

compartments, one for each casemate, and each compartment would require a door to the outside for removing the urine tub and for cleansing, without passing through the barrack room.

The principle of this arrangement is shown in Plan XV., where it is applied to a barrack hut with a verandah.

In new barrack huts the arrangements may either be of this kind, or one or other of the methods of placing the night urinals shown in Plans I., II., III. may be adopted.

Where a urine tub is provided in a separate porch the water tap already mentioned might be placed over it.

### 10.—Ablution and Bath Accommodation.

Sea bathing is in use at all the stations. Fresh-water baths, as a means of cleanliness, have not yet been introduced. For this latter purpose sea-bathing alone cannot be relied on, because sea water does not cleanse like fresh water, unless marine soap be used at the same time. At Malta and Corfu there would be water enough under improved methods of distribution to afford the means of fresh-water bathing. At Gibraltar and at the smaller Ionian Islands stations it is to be feared that fresh water will, under any circumstances, not be available for baths. We have recommended a few salt-water baths on trial, with an issue of marine soap. If these are found sufficient for cleansing, the number can be extended, and the baths could be used with fresh water if at any subsequent time a sufficiency should become available.

Baths are made of metal, enamelled, painted, or galvanized; the cheapest material is perhaps slate, which is found to answer every purpose. The common slate bath is shown on Plan XVI.

Also a modification of it by Mr. Jennings for preventing waste of water. The glazed terra cotta bath, by Rufford and Finch, shown in the same plan, is too costly for barrack use, but it is the most suitable for hospitals on account of its cleanliness, and better adaptation for preventing waste of heat when warm baths are used.

There is sufficient water everywhere for ordinary ablution purposes, but in consequence of defective distribution of water, and general insufficiency in the ablution arrangements, the means of personal cleanliness are, even exclusive of baths, insufficient for the requirements of the climates.

In most cases water is not laid on, but has to be carried by hand. Sometimes part of the supply is carted by a contractor. At not a few barracks the ablution rooms are of a very inferior kind. There is scarcely a good ablution table to be met with. At some barracks there is no ablution room, and the men wash in their rooms, or in the open air outside.

Generally it may be stated that the inducements to cleanliness are insufficient, and that the ablution arrangements require either great improvement or entire re-construction.

Instead of the present wooden or porous stone slab, with moveable iron basins and no water laid on, we recommend that ablution tables of slate, with sunk earthenware basins, and water laid on to each basin, be introduced. Also that a sufficient number of foot-pans, now made of earthenware, be provided. Water should be obtained either from a raised tank for supplying water for all purposes, or from a special tank for affording water to the ablution room.

Plan XV. shows the most recent improved form of earthenware ablution basins and stands.

The ablution rooms are often dark and deficient in ventilation. This is especially the case with those in casemates. It is difficult to remedy this defect, unless by building a proper room.

A good, light, clean, cheerful room, with plenty of air, and water laid on to the basins, and proper drainage, are essential requisites for cleanliness. There are examples of ablution rooms of this kind at the new barrack huts at Gibraltar, and also at Pembroke Barracks, Malta, and they bring out very strongly the deficiences of the same class of accommodation in other barracks.

The ablution and bath room shown on Plan XVII. is sufficient to give an idea of the kind of accommodation required for existing barracks. The number of basins and baths would of course depend on the size of the barrack.

In all new barracks the best arrangement of ablution rooms is to attach a small room to each barrack room in the manner shown in Plans I., II., III., and to fit it up with a few fixed basins and water laid on. This has been done in all the recently constructed barracks at home.

In new barrack rooms where this arrangement is adopted, a separate bath house, with a number of baths proportioned to the size of the barrack, should be provided in a convenient position.

### 11.—Cook-houses.

All the barracks have cook-houses. Some are in casemates, others have been specially erected for the purpose. They differ very much in character; but taking the climates into account, they are, with few exceptions, insufficiently ventilated, very hot, and they do not admit of much improvement in these respects. Except the new cook-house for the Europa huts, and the one belonging to the Pembroke Barracks, none of them are provided with good cooking arrangements. They have all boilers of the old pattern. Some of them have stone ovens of bad construction, requiring a large amount of fuel to heat them; only one or two have a water supply, and the drainage is generally defective.

We have given the details for every barrack in the reports, and we would merely state here that the ventilation and temperature of all these cooking places should be examined when the dinners are being cooked, and the ventilation improved by louvres or openings facing the wind, as far as it may be practicable to do so.

Improved forms of cooking apparatus are described in the general report of the Barrack and Hospital Improvement Commission.

The new steel ovens and boilers, Plan XVIII., recently introduced at home, are the most durable and economical yet devised, and should be put up instead of the present insufficient arrangements. They admit of being adapted to barracks of any size; but where 400 or 500 or more men have to be cooked for every day, Benham's apparatus will be found very convenient and economical, provided it be properly constructed and managed. Such of the cook-houses as do not admit of sufficient improvement (like the one at Fort Manuel, Malta) should be replaced by buildings of proper construction, as shown in Plan XIX.

They should all be drained and supplied with sinks, and water should be laid on. Proper dressers and tables should also be provided.

### 12.—Cleansing.

At most of the barracks the barrack refuse is collected and retained in ashpits, often in confined localities and close to the men's rooms, until it is removed by the contractor. This practice gives rise to nuisance which is much more likely to be injurious to health in these warm climates than at home. We recommend that all these ashpits be abolished, and that the places occupied by them be raised above the level of the ground and flagged. Iron boxes should be provided on these spaces to receive the refuse, and their contents should be emptied and removed daily.

### 13.—Hospitals.

In consequence of our attention having been specially called to the condition of the hospitals, with a view to improving the existing buildings as far as practicable, we examined all the establishments minutely, and we have stated in our reports the facts in regard to each hospital in detail.

There is no military hospital at Gibraltar. The accommodation for the sick in that large garrison is in a hospital belonging to the Royal Navy, and lent during pleasure to the War Department.

Like most naval hospitals, it is an excellent building, but its general arrangements are those of a naval and not of a military hospital. Considering the tenure on which it is held, we could not recommend its improvement to the extent we should otherwise have desired, but we have recommended alterations and additions, which, when complete, will improve materially its sanitary condition, and enable it to be organized as a general hospital.

There is not a single good military hospital in Malta.

There are four hospitals, all of a very inferior description, and all bad except the Spinola hospital, which is a private house in the country, and has the advantage of fresh air, doing work which could be done much better and cheaper by one good general hospital, with ambulances, or at most by a general hospital for Valetta, and a subsidiary one for the Cotonera barracks. Besides these four hospitals there is a fifth, a sanitarium at Citta Vecchia, seven miles from Valetta.

The real reason of this multiplication of establishments is the bad state of the principal hospital. We have carefully examined the hospital question as regards this garrison, and have been reluctantly compelled to arrive at the conclusion that none of the existing buildings within the garrison can be rendered sufficiently good for the reception of sick at any moderate cost. We have, therefore, recommended, for reasons stated in the report, that the existing buildings should be altered, to render them fit for extending the barrack accommodation, and that one general hospital should be erected for Valetta, and a small subsidiary hospital for the Cotonera side of the great harbour. The excellently situated sanitarium at Citta Vecchia we propose should be retained for convalescents.

The hospital at Corfu is a casemated building in two floors, not on a good plan, but admitting of alteration and extension which will render it sufficient for the wants of the garrison.

The smaller hospitals at the other Ionian Islands vary much in character. The hospital at Santa Maura would be sufficient with the trifling addition of an orderly's room and bath room.

The hospital at Cephalonia is sufficient, but requires improvement in a few sanitary details.

The hospital at Zante Castle is perhaps the best in the command. It is of recent construction, and occupies a lofty, airy position.

There are no hospitals at Paxo and Ithaca. Both garrisons have their sick treated in private houses rented for the purpose. The hospital at Ithaca is a single floor of a very inferior house, and affords the worst accommodation for sick we have ever met with.

For these small stations, and for detachment stations generally, a small hospital similar to the one proposed for Cerigo, Plan XX., would answer every purpose.

All the Mediterranean hospitals are more or less overcrowded, especially as regards superficial area per bed, which is the most important element in these climates. In the new hospitals we have proposed to build at Malta we have adopted the regulation of 1,500 cubic feet, and about 100 square feet per bed.

None of the existing buildings have any special means of ventilation, and all require foul air shafts and inlets for fresh air constructed on the same principles as those we have recommended for barracks.

In these climates the more ventilation by open windows is trusted to the better, but a constant movement of the air should also be provided for, when on account of the weather the windows have to be kept closed.

All the defects we have described in the barrack drainage and latrines recur in the hospitals. In some instances, indeed, these defects are worse than in any barracks. All require the same class of remedies we have advised for barracks. None of the hospitals have any water-closets. They have only offensive latrines. We have as far as practicable recommended water latrines or water-closets to be provided for the wards.

The ablution and bath arrangements were everywhere deficient. These have been undergoing improvement since the time of our inspection, but at that date there was not a single hospital possessing suitable provision either for washing or for bathing sick.

We have recommended suitable ablution rooms, with baths and water laid on, to be introduced wherever practicable.

We found none of the hospitals provided with convenient administrative accommodation, and the arrangements for orderlies and hospital serjeants were all more or less deficient. We have recommended that proper accommodation be provided for the attendants, to obviate the necessity of their sleeping among the sick.

# PART II.—BARRACKS AND HOSPITAL AT GIBRALTAR.

We shall include in this part of our report a short sketch of the topography, climate, and diseases of the station, together with an account of the sanitary condition and improvements required in the town, barracks, and hospital.

## SECTION I.—TOPOGRAPHY, CLIMATE, DISEASES, &c. OF GIBRALTAR.

### 1.—Topography.

The rock of Gibraltar is a lofty peninsula projecting into the straits, and extending in a line nearly north and south, in latitude 36° 6′ 20″ N., and in longitude 5° 20′ 53″ W. The extreme length of the rock, from Forbes' Battery to Europa Point, is about 4,760 yards, and its extreme breadth, from King's Bastion to the neighbourhood of Catelan Bay, is about 1,600 yards. Its physical character is that of a broken rocky ridge running north and south, having very steep rugged slopes on the west and south sides, and vertical precipices on the north and east sides. The highest line of the ridge, which is in some places so narrow that it can be crossed almost by a single step, is broken into three principal summits. One at the northern extremity, called the "Rock Gun," is 1,350 feet above the sea level; Saint George's Tower towards the south end, above Windmill Hill is 1,439 feet, and the signal house which lies nearly midway between these two points is 1,276 feet above the sea level.

From the central ridge a succession of terraces and slopes of greater or less breadth and inclination, fall towards the west and south, occupied by gardens, paths, and roads, private residences, batteries, promenades, barracks, and by the town itself. Most of the town, however, is built on a talus of red earth, extending from the sea-shore some distance up the slope, and re-appearing high up in cavities in the rock. A similar talus, but of sea sand, extends on the east side from the sea level to a considerable height up the rock. The east side of the rock is washed by the Mediterranean, the west side by the waters of the bay of Gibraltar, and on the north side the rock is connected with the coast of Spain, by a neck of sand about a mile long and from half a mile to a mile broad, raised a few feet only above the level of the sea, and partly covered with water during the rainy season. Water is generally found in the sand within four feet of the surface.

The rock consists chiefly of a hard limestone breccia, with a few fossils found in cavities. There are several large caves with animal remains: deep rocky ravines towards the southern extremity; and large natural gulleys which concentrate the rain-fall of the higher slopes on the upper part of the town. The rock is almost surrounded by the sea, and being exposed to no extraneous source of malaria, it ought, so far as its topography is concerned, to be a healthy locality. There is, however, one vulnerable point of the very greatest consequence as regards health, according to the manner in which it is dealt with, and that is the talus on which the town is built, with the slopes and gulleys above it. As already stated, this talus consists mainly of red earth, a substance capable of absorbing and retaining a large quantity of water or of any other fluid poured into it. It has, indeed, hitherto been a considerable source of water supply for the population. So much water does this peculiar earth imbibe, that when we were at Gibraltar, at the end of the hot season, a section of it exposed in one of the streets was saturated with moisture. We shall recur to this part of the subject when discussing the question of drainage, but we may here remark, in passing, that if from any faulty direction of walls or substructures, or from any neglect of house or other drainage, such a subsoil becomes charged with water or with sewage matter, it will certainly give out dangerous or fatal malaria, under high temperature and other favouring atmospheric conditions.

Another very important topographical peculiarity has resulted from the construction of the defensive works. These works are built on the sea-shore at the water level, along the entire front of the town: their foundations are sunk far below the surface, and they would, in the absence of a very complete system of drainage, form a barrier between the rain-fall flowing down from the heights above and its natural outlet, the sea. The flat ground lying within the wall, and on which the lower part of the town is built, would, in such a case, become the depository of the whole of the drainage. Besides this, outside the works, at a distance of 60 to 80 yards, a low breakwater for defence purposes has been carried along the front of the town. Between it and the wall is a strip of shallow sea water, which, at low tides and under a hot sun, becomes exceedingly offensive from the decomposition of the salt water by organic matter from the town sewage, which is poured into the bay along the line.

It will be seen that it is within the province of ordinary engineering to remove all

these contingent topographical defects, and if this be done, the rock may become a healthy and agreeable residence.

The other topographical details will be more readily understood by reference to the map and sections, Plans XXI., XXII., XXIII., which will show how small an amount of level ground there is within the fortress, and how large an area is covered by its densely-packed population.

### 2.—Climate.

There is an excellent meteorological observatory at Gibraltar, until recently in charge of the Royal Engineer Department, from the carefully kept records of which, abstracts given in the Appendix No. 1, have been made for us. They show the climate of the rock to be insular in its character, neither very moist nor very dry, not subject to extremes of heat or of cold, but possessing a high sun temperature, the effect of which on the sensations is even greater than the thermometer would appear to indicate. The prevailing winds vary considerably in different years, but there is generally a large amount of east wind, which has a peculiar effect on the climate while it lasts. It is often accompanied by local fogs, occasioned by the warm moist air of the Mediterranean being thrown upwards by striking against the rock to an elevation sufficient to deposit its moisture. In the Abstracts of Climate, 1853-4, published by the War Department there is an interesting note from Major-General Harding on the physical effects produced by this wind. He states that oil paint, if laid on during the east wind, will not harden, but remains adhesive, and retains this quality for one or two years on a recurrence of easterly wind, although apparently dry when the wind is west. Meat will not keep. If a divided leaf of the terebinth tree be floated on water when the wind is westerly, the oil comes out of the pores in jets and moves the leaf about, but in an east wind the oil comes out in a liquid state and the leaf is motionless. The east wind is charged with producing all manner of ailments, mental as well as bodily, while it lasts, but it does not appear to inflict any permanent injury on health.

The amount and regularity of the rain-fall is a point of primary importance to the garrison, because it is the chief source of the water supply, and accordingly records of it have been kept for a long series of years. The annual quantities from 1790 to 1860 are given in Appendix No. 1, and show a very great diversity in different years. The smallest rain-fall on record was in 1836, in which year the quantity was little more than 13½ inches. The largest recorded fall was in 1855, when it was nearly 76 inches. The mean rain-fall of all the years of observation has been 32·809 inches. There has been a very deficient rain-fall in six years out of 71 years. There is usually very little rain in summer. Sometimes there is none for several months. The rainy season usually commences late in September or early in October and continues till the end of spring. Frequently a large amount of rain falls in a few hours, deluging the streets; flooding the very large iron gratings over the sewers, and bursting the main sewers in the low districts close to the sea.

Notwithstanding heat, east wind, and heavy rain, the climate of Gibraltar is a fine and healthy one, at least for healthy people; but certain classes of invalids recover much more rapidly when sent away from it.

### 3.—Diseases of the Native Population.

The populations of the southern provinces of Spain have been in times past specially subject to periodic fevers,—intermittent, remittent, and to yellow fever. Since the beginning of the present century, as shown by the late Inspector-General, Dr. Gillkrest, in his report on the disease,* no fewer than 59 localities in Andalusia, 16 in Murcia, and 11 in Valencia have suffered from yellow fever. In many of these places he states that the disease was confined to circumscribed localities, where the sanitary conditions were notoriously defective, and did not extend to the mass of the population.

Gibraltar, situated at the southern extremity of Andalusia, is one of the 59 localities where yellow fever has prevailed in this province. The first recorded attack was in 1649. Since the date of the British occupation in 1704, there have been five epidemics, of greater or less severity, occurring in the years and occasioning the mortality, shown in the following table:—

| Years. | Mortality. | |
|---|---|---|
| | Military. | Civil. |
| 1804 | 869 | 4,864 |
| 1810 | 6 | 17 |
| 1813 | 391 | 508 |
| 1814 | 114 | 132 |
| 1828 | 507 | 1,170 |

* General Board of Health, second Report on Quarantine (Yellow Fever) 1852. Appendix No. 1.

There is evidence to show that in the intervals between the epidemics, remittent fever, sometimes bilious remittent, frequently prevailed, and that occasionally there were sporadic cases of the more severe form, yellow fever. But the sanitary history of the garrison is very imperfect, and no exact account of any of the epidemics in all their relations has come down to us. If half the care had been spent in ascertaining facts, that was at the time bestowed on proving yellow fever to have been imported and not of local origin, humanity would have been greatly the gainer. It appears for many years to have been deemed a heresy in any person to assert that remittent fever was of usual occurrence either among the civil or military population; and we have positive evidence that, until the late Dr. Hennen went to Gibraltar, cases of remittent fever were compulsorily reported as continued fever, lest the real facts of the case should weaken the presumed evidence for yellow fever being of foreign and not of local origin.*

Nevertheless, the evidence of experienced medical men, who had no theory to support, is sufficient to prove that bilious remittent fever has been in times past not an unfrequent indigenous product of the rock. It would be quite beside our duty to enter further into this discussion. What we have to do is to ascertain generally the nature of the diseases to which the population is now liable, with the view of examining into those local conditions which experience has shown to favour their origin and propagation.

With the view of arriving at the facts we called for the mortality statistics of the civil population. The result for 1860, the only year for which we could obtain it, is given in the Appendix No. 2, printed as we received it. It will be seen from this return that no proper system of registration is yet in force in Gibraltar. The police do the best they can to arrive at the facts, but neither the nomenclature nor arrangement conveys any definite information on some of the most important points of the inquiry; and the chief value of the return is, that it proves the necessity for assimilating the registration at Gibraltar to that in use at home. We endeavoured to ascertain how far it might be practicable to do this, by obtaining the statistics of sickness and mortality among the indigent poor attended at their own houses. Deputy Inspector-General Paynter was good enough to undertake the labour required in reducing the data into some general form, and the result of his work is contained in the Appendix No. 3, giving the admissions and deaths arranged according to the nomenclature and classification adopted in the army returns, which are essentially the same as those used by the Registrar-General of England. This table contains the only reliable information as to the nature of the diseases of Gibraltar we have been able to procure. It is sufficient to show how advisable it would be to reduce all reliable existing data into the same form for public use, to save as much as possible of the past sanitary history of this important garrison from oblivion.

Dr. Paynter's table shows that 41½ per cent. of the admissions, and 16½ per cent. of deaths, among the poor, were due to miasmatic diseases; and the police returns attribute above 20 per cent. of the mortality in the town of Gibraltar to the same class of maladies. The police return for 10 years gives a total mortality of 30·4 per 1,000 per annum, which is a very high rate on a small fixed population of 15,562 living in a climate not unfavourable to health.

The police return of mortality for one year, 1860, shows a considerable difference in the health of the two extremities of the rock. The southern end, which is inhabited by a sparse population of 1,664 persons, yielded a death rate a little over 27½ per 1,000; while the densely-peopled town of Gibraltar, with a population of 13,898, showed a mortality of above 36 per 1,000. The prevailing diseases are fevers, and other zymotics, tubercular, and chest diseases. It is a singular circumstance that above 10 per cent. of the deaths are returned as due to old age. The mortality under 5 years is 35½ per cent. of the whole. Dr. Paynter's return is the only one which affords any satisfactory information as to the nature of the fevers. It shows that out of 197 cases admitted, 9 belonged to the periodic class, and all were mild intermittents. Common continued fever gave 180 cases, with 3 deaths, and there were 6 cases of typhus and 4 of typhoid fevers.

The evidence, such as it is, and also the statements of medical men at Gibraltar, go to show that remittent and other periodic fevers have become less frequent of late years among the civil population.

Although far greater attention has been paid to drainage and cleansing of late years than was formerly the case, much remains to be done before Gibraltar can be considered safe from outbreaks of epidemic fevers and other epidemic diseases. There was an outbreak of cholera in 1860, which carried off 38 persons in the town, a very considerable

* Second Report on Quarantine, p. 130.

mortality for so small a place, and this event is quite sufficient to show that there are still sanitary defects in the garrison highly dangerous to the public health.

Although the importation of yellow fever in 1828 was at one time a favourite hypothesis, both with the inhabitants and authorities, who were afraid of the commercial results likely to arise from admitting that the disease was indigenous, there were not a few enlightened men who saw clearly that there were local causes within the garrison quite sufficient to account for its local origin and extension.

Then as now the town had a clean external appearance, although it is very doubtful whether it had ever been as thoroughly and continuously cleansed as has been the case since the last epidemic. When the houses were examined the internal sanitary condition was found to be very different from external appearances. The houses were overcrowded, 100 persons were found in one house fixed by police regulation for only 20; their construction and arrangement were incompatible with free ventilation; the courts and houses filthy, the drainage as bad as possible, the sewers choked with filth to such an extent that in one street close to the Town range barracks from 20 to 30 cart-loads of filth were removed from a sewer which was opened in it. The sewers were the cesspits of the whole population. Every shower of rain increased fermentation in their contents, and foul air was poured into all the small courts and houses through the open gulley grates. The condition of the sewers was such that even rats died in them. This most dangerous state of the drains extended to nearly every building, and no doubt the whole population was as thoroughly prepared for the yellow fever epidemic before it appeared as dry wood is for fire. In the district where the disease first broke out the pauper population was "dense to a degree incredible;" "living in sheds without drainage, generally "composed of the slightest materials, in tiers of beds as close as in a crowded transport "numerous individuals slept."*

We now know the very important part which impure water plays during epidemic seasons in determining fatal outbreaks of disease, although this was little considered at the time yellow fever prevailed in 1828. At that period the chief sources of the water supply for the civil and military population were shallow wells dug in a subsoil saturated with filth. Rain-water tanks were not in use even for the troops until within the last 25 years, and not for the civil population until several years later.

As already stated, there has been considerable improvement since that time. Drainage and paving have been extended, rain-water tanks have been introduced, and cleanliness more strictly enforced. Overcrowding is kept down as far as practicable, but there is much yet to be done. The present mortality is excessive, and the prevailing zymotic diseases are those connected with overcrowding, want of domestic cleanliness and defective ventilation, bad water supply, bad drainage, and sewer gases. His Excellency the Governor and the civil departments under him are alive to the importance of the subject, and measures for improving the water supply and main drainage of the town and garrison have been for some time under consideration. Frequent representations on various important matters of detail, affecting the health of the garrison and troops, have also been made both by military and medical authorities. Hitherto little practical result has followed from their proposals, and the time has certainly arrived when these various questions should be dealt with, and this important garrison placed as far as practicable beyond the influence of epidemic diseases.

We next proceed to describe briefly the present sanitary condition of the town itself, together with the measures required for improving it.

### 4.—Sanitary Condition of the Town of Gibraltar.

1. Construction of Houses.—As already stated, the population of Gibraltar is located on two divisions of the rock, one at the northern, the other towards the southern extremity. The former includes the town, and is cut off from the latter by a fortified wall.

The town area covered by houses is about 1,200 yards in length by about 400 in breadth, and contains in round numbers, 100 acres; the permanent population is 13,898, giving a density of about 69,000 persons per square mile. The occupied surface presents very different degrees of fall. A large portion of the town, about a third of the whole, is built on a strip of comparatively flat ground between the steep slope of the rock and the line wall from 12 to 20 feet above high-water mark. The remainder is built chiefly on the slope on terraces, one over the other, rising to an elevation of 210 feet above the same level. Over this again rises the lofty rocky ridge already described, with its descending gulleys so arranged that they concentrate the rain-fall on the upper parts of the town. In the absence of drainage, the water flowing down these gulleys would have to find its way to

* The details are given in the report already cited.

the sea, either over the surface or by sinking into the porous talus of red earth already described, on which the whole of the lower part of the town is built.

With the exception of secondary cross streets the rows of houses are built across the natural course of the drainage. In many cases the rock or bank is scarped to find room for the streets and lanes, and the houses abut on the rocky or earthy section. The natural disadvantages of the site are very considerable, and without due care as to cleansing and drainage, it must undoubtedly be prejudicial to health and predispose to fevers and other epidemic diseases. But fortunately all, or very nearly all, these disadvantages can be neutralized by sanitary works. A portion of these works has already been designed and executed, and there is every prospect, if the further works which we shall recommend are carried out, that the garrison will become as healthy as it ought to be from the fine local climate.

But unfortunately, the older part of the town has been built without regard to health. Many of the houses are very bad and would be considered as unfit for human habitation at home. Several which we examined presented very extraordinary specimens of house architecture. Their condition will be best understood from the following sketch of their construction: Suppose an area of ground, about 40 feet square, enclosed within four solid walls 40 feet high with a doorway through one side. Suppose, again, three or four floors of rooms built against these walls inside the area, leaving only a narrow court a few yards in width between the opposite rooms, the doorway through the wall affording the only means of ingress to the court. These houses would have windows only to the court and no through draft. Suppose, besides, that the court is badly paved, with an open gulley or two, and an open privy communicating with a sewer loaded with filth, and that the houses are most of them dark, all of them unventilated and overcrowded, that they are occupied by people who carry on trades and manufactures in them, and often store in the houses all kinds of worn-out refuse articles. Suppose all this in a hot climate, and a very good idea will be formed of the sanitary state of the population in the lower parts of the town. The bane of this form of house construction is the narrow inner court, without any ventilation for the houses except what comes down from the top. No engineering works will remedy this. It can only be remedied by reconstruction. No openings can be made in the outer walls of the houses because there are other houses similarly constructed beyond. The only way to improve these places is to pave and drain them properly, and to enforce the most rigid attention to cleansing, both within and without the houses.

But prevention of nuisance is the only thing over which the local authorities have power at present. They cannot enter the courts or *patios* to compel either paving or draining; in other words, however desirous they may be, they cannot compel efficient cleansing, for this is impossible without good paving and draining. This power of entry is absolutely necessary for public safety, and until it is granted to the authorities the public health of Gibraltar is at the mercy of landlords, some of whom are non-resident, and appear to care very little about their property or its tenants. The interiors of the poorer class of houses are miserable in the extreme; the great evil being want of sufficient light and air. They are dirty, the walls mouldy, and the people wretched.

Many of the house rents would be considered most exorbitant in any town in Great Britain. This of course arises from the high demand for houses, but it proves that there are plenty of means of paying for any necessary improvements. If high rents are charged, the local authorities should at all events have power to see that the houses are kept in a healthy condition by their proprietors.

Generally the houses in the higher parts of the town are of a better character, they are built in single lines or are detached, with plenty of light and air about them, but they are all deficient in drainage and in domestic arrangements. As a whole we feel bound to state our opinion, that so far as their construction, cleanliness, and drainage are concerned, the description of the state of the houses during the last epidemic of yellow fever, we have quoted above, is by no means inapplicable to their present condition.

2. Drainage.—The drainage plan and sections, Plans XXII. and XXIII., appended to this report, show the present lines of sewers and drains. The system consists of four main lines commencing at the higher end of the town, and carried in as straight courses as the streets and inclinations will allow, directly through the works into the sea. Branches are led into these sewers from the streets along their course, and the house drains are connected with them. The sections are mostly square, and the sewers have, thus, flat instead of curved bottoms, and they pass through the works with a very slight inclination. The lower districts of the town are either drained to the same outlets, or where these are not convenient, separate outlets are carried across the breakwater to the open sea. One of the mains, as shown in the section, commences at a height of about 128

feet above high-water mark, and reaches that level after a sectional course of about 1,000 feet. Another commences at a height of 264 feet, and descends to the sea level after a course of about 1,500 feet, 500 feet of the lower end being nearly horizontal. A third has a fall of 264 feet in 2,200 feet. A fourth discharges its water into a nearly horizontal main, after a fall of 232 feet in 1,550 feet. The peculiarity of the system is, that the rain-fall on the surface of the town and on the roofs of the houses, together with the deluge of surface water which descends from the highly inclined slopes above, runs with extreme rapidity from all the higher levels into the lower and flatter districts, where it bursts the sewers, saturates the subsoil, and interferes with the efficient drainage of all the lower parts of the town.

As we shall presently see, there is no water supply except what is carried by hand, and the result is that although the sewers and drains are flushed out, more or less effectually, by heavy rains, most of the excreta of the population is retained in the sewers and drains in the interval between the rainy seasons; the drains become nothing but cess-pits during the dry, warm, and unhealthy months of the year, and the entire drainage system is most offensive and unwholesome at such times.

The outlets are very bad; the sewage is carried in iron pipes across the shallow water intervening between the line wall and the breakwater, and is discharged outside; but during heavy rains the drains generally burst outside the line wall, and within the breakwater; the sewage finds its way in a diluted form into the shallow water, and there becoming decomposed in warm weather it gives rise to intolerable nuisance. Indeed in several cases an opening is purposely left in the drain outside the line wall to allow of overflow, which leads to the same result.

There is no sewer ventilation, and the foul air finds its way through badly-constructed untrapped gulley grates and privies into the streets and to the interior of the *patios* and houses.

However defective the existing drainage system may be, the main sewerage at present is very much better than the house drainage. Indeed, hardly anything could be worse than this is, and it will be a great mistake to expect superior health from any improvements in the main drainage unless a radical change be effected in the house drainage.

Every house appears to have a drain of some kind or other. It commences in the *patio* or court, by an open, untrapped, or badly-trapped orifice, through which the most offensive gases escape.

There are no water-closets, at least in the poor class of houses; there is one privy generally for the whole population of the court. It is merely an opening over a badly-constructed drain, without water, except what may be thrown into it by hand, and admitting the sewer air as well as nuisance from the place itself freely into the court.

The surface drainage of these courts is often very bad. Rubble stone is used for paving, and where there are flags they are often broken or uneven, allowing filth and foul water to lie on the surface, endangering the public health.

These very serious drainage defects have occupied the attention of the military authorities, and they propose to remedy them in the following manner:—

It has been proposed by the Commanding Royal Engineer to intercept the sewage from all the higher levels of the town, except a small district at the north end of the town, by an intercepting sewer 3,200 feet in length, commencing at the point where the level of the high-level sewer reaches the foot of Bell Lane, at an elevation of 20 feet 2 inches above high-water mark. From this point the sewer proceeds southward, following the line of the main street of Gibraltar; through the South bastion, and terminates at the Ragged Staff. The form of the sewer is egg-shaped, 2 feet 6 inches high at the commencement and 4 feet 6 inches at the outlet, where it is continued out beyond the end of the quay 250 feet from the shore. The sewer will be closed against the influx of sea water at high tide (which would back-water the outlet to a considerable distance), while it will permit of free discharge of sewage as the tide falls. There will be 6 feet of water over the sewer top at low water. The current setting round the bay will pass the mouth of the sewer, and carry the sewage into a large body of water, where it will become sufficiently diluted to be harmless. This intercepting sewer will turn aside from the low flat districts of the town very nearly the entire rain-fall of the surface of the higher part of the town, which at present flows into these low districts, and only the drainage of the lower districts will have to be carried in its present course through the line wall. The relation of this intercepting sewer to the existing drainage is shown on Plan XXIV.

The scheme is correct in principle, but it is intended only for the relief of the sewers of the lower districts from the sewage of that part of the town built on the slopes above. It does not contemplate cutting off the rain-fall of the higher hill slopes from the subsoil of the town, and yet this is an element absolutely essential to the public health. This

higher water should be intercepted and turned away altogether from the town, and either conducted directly to the sea, or, as we shall propose presently, it should be collected as a water supply for the population.

If combined arrangements of drainage and water supply such as we contemplate be carried out, as they ought to be, they will lay the first foundation for a good drainage system for the garrison, by saving the low flat districts from the accumulated sewage and rain-fall of the higher; by diverting the rain-fall of the higher slopes and converting it into a source of water supply, and by diminishing very greatly, if they do not entirely remove, the nuisance at present occasioned by the deposit of sewage along the course of the breakwater.

As already stated, no sewer can be kept free of deposit in a place where there are several months in the year without rain-fall, and where the domestic water supply is so deficient. The new system of sewerage must therefore be accompanied by a special supply of water for latrines and waterclosets and for cleansing the sewers when necessary. Fresh water is not available, and salt water will answer the purpose. This may be obtained either by erecting a pumping engine near the Ragged Staff to throw water to elevated tanks, by means of a pipe carried up in the line of Charles V. wall, as proposed by the Commanding Royal Engineer, or (what would be better) by using the pumping engine already erected at the south, to raise water to reservoirs placed at sufficient heights above the sea, from which pipes would convey the water to the waterclosets and latrines of all houses and barracks, and also to flushing tanks at the head of the main lines of sewers to sweep out any deposit in dry weather. This last object is the only one aimed at in the scheme alluded to for flushing the drainage, but flushing will be of little use unless all the open privies are abolished, and water latrines or waterclosets substituted for them. When the improvements are completed, in place of the 11 outlets at present along the breakwater there will be five, which will drain only a small town area, together with the casemated barracks, and by carrying these outlets into deeper water there need be no nuisance from them.

It is very probable that most of the existing sewers will have to be reconstructed on account of errors in form. Those which we saw opened contained deposits and were very offensive. The intercepting sewer will remove part of the evil, and enable much smaller sewers to be introduced in the flat districts than the present ones: but unless this be done there will be some risk lest the very disproportionate size which the present sewers will have when the high drainage is cut off, should lead to greater accumulations in them. We therefore recommend that the whole of the lower districts and all the houses and courts should be drained by glazed pipes.

Another essential improvement required is the ventilation of the main sewers high up on the rock. Shafts erected over the highest points of the mains, of the same diameter, and carried 20 or 30 feet above the top of the highest houses, would become heated by the sun, and would have draught sufficient to keep a continual current down all the sewer openings, instead of the foul air coming up through the openings in streets and courts, as is the case at present.

3. Water Supply.—We have given in Appendix No. 6–7, the statistics of the water supply for the civil population, from which it appears that 179 houses, containing 2,775 inhabitants, have no water except what is carried to them; 133 houses, containing 2,320 persons, are supplied with bad or brackish water from wells dug in strata penetrated more or less with sea water and polluted with organic matter. Ten wine houses and taverns have similar bad water, and 136 houses, with 4,497 inhabitants, have cisterns or tanks yielding water for 10 months only in the year.

From all the sources together, the supply is something very different from what is considered requisite for health and comfort at home. The present consumption of the civil population of the garrison for all purposes is only from a gallon to a gallon and a half per head per diem.

The inadequate supply of water is greatly due to absolute deficiency of this prime element of health and cleanliness, partly to the cost of distribution. It is hardly too much to say that there is not a water pipe in the whole town except the old aqueduct. The garrison quartermaster states, (Appendix 6,) "that the inhabitants owe nothing "to the British Government for the small supply of water they have had for 150 years." They have had to supply themselves, and at a great cost too. He shows that the mere cost of carriage paid by fewer than 10,000 inhabitants (less than two-thirds of the civil population) amounts to a voluntary water rate of 2,500*l.* per annum.

The acting police magistrate (Appendix 7) states, the approximate quantity of water brought into the garrison by hand in 1860 at 2,243,580 gallons, at a cost of 3*l.* 19*s.* 1*d.* per house for the 853 houses included in the North district. If we take the mean of the

two returns we find the present cost amounts to 3,000*l.* per annum for say a gallon and a half per head per diem on a town population of 13,898, or upwards of 4*s.* 3*d.* per head of the population per annum; or 8*s.* per 1,000 gallons. Each *person* in Gibraltar thus pays about as much per annum for 1½ gallons of water a day, carried by hand, as a whole household in our improved towns pays in England for an unlimited supply laid on by pipes.* This simple fact is enough to show that there is a rate-paying power quite sufficient, to say the least of it, to enable the present utterly defective system to be put an end to, and a water supply by gravitation to be provided for every house in the garrison.

These general remarks on the water supply of the town apply to that for barracks.

The tanks and wells for supplying water to barracks and hospitals are by no means sufficient for the purpose, and a considerable amount of water is carried daily to the different barracks from the well on the Neutral Ground and from other sources of supply within the lines. The average annual cost of carriage varies in different years, but an average of five years gives a charge on the public of 500*l.* per annum, which is paid to a contractor (Appendix No. 6). This annual outlay, though smaller in proportion than that incurred by the civil population, nevertheless represents a capital which would go a considerable way in supplying the necessary amount of water for troops by gravitation.

There is no water laid on for any one purpose, either for cleanliness, washing, cooking, drainage, latrines, or water-closets. Most of the barrack wells are not safe for drinking or culinary purposes. Many of them contain water offensive to the taste. The tanks, although containing better water, are underground, and often placed in dangerous proximity to drains and other nuisances; or they are supplied with rain water from surfaces covered with impurities. There is hardly a barrack into which some part of the water supply has not to be carried, in barrels on carts, or by fatigue parties, and the men are limited by regulation to about one third the quantity found to be necessary in this country for health and cleanliness.

The military population is at all times on a water allowance just as if the garrison were in a state of siege. The allowance is stated in Appendix No. 8, and is utterly incommensurate to the soldiers' wants in such a climate, either for comfort, cleanliness, or health.

The following table gives the present scale :—

| | | | |
|---|---|---|---|
| Commanding officer | 7 gallons each a day. | Horses | 6 gallons each a day. |
| Non-commissioned officers, rank, and file | 2½ „ „ | Officers' mess | 100 „ „ |
| Women | 2½ „ „ | Serjeants' mess | 14 „ „ |
| Children | 1 „ „ | School-room | 8 „ „ |
| Civil servants | 2 „ „ | Dispensary | 8 „ „ |

The commanding officer's allowance in this scale is the one which is found to be necessary for every head, including children, of the civil population at home.

The quantity of water at present available within the fortress is thus totally inadequate to the wants of the troops and population.

The only natural water source for Gibraltar is the rain-fall. The rain which falls on the slopes of the rock descends in immense quantities to saturate the red earth on which the town is built, whence it is drawn by wells; and by a natural system of percolation through a large mass of debris at the south end of the town where the Alameda is situated. Rain water from roofs and from the surface of the rock is stored in underground tanks.

From the bad state of the drainage in time past, it may be doubted whether a single well, especially in the lower part of the town, yields wholesome water.

The water from the Alameda is conducted in an underground aqueduct along the lower level of the town, and is used for supplying public fountains. This work is said to have been executed by an Italian during the time of the Spanish occupation. The principle adopted is an extremely simple one. The mass of sand at the Alameda receives the accumulated rain-fall of the slopes above, and acts as a natural reservoir and filter, from which the water is collected by ducts to a central reservoir, and is thence conveyed by a conduit, partly of masonry, partly of earthenware pipes, to the fountains. The flow is continuous, and the method of distribution is as ingenious as the means of collection. At the time of our inspection at the end of the dry season the supply appeared to be of the usual amount.

* For example, the population of Alnwick, 7,000 in number, has a constant water supply of 120,000 gallons a day, and the annual water rate is about 8*d.* in the pound. A 4*l.* cottage pays 2*s.* 8*d.* a year, and a 10*l.* house 6*s.* 8*d.* per annum. The usual cottage water rate in small towns supplied by water companies is 5*s.* a year.

The supply appears to have been sufficient for the garrison of that day, and was conducted close to the barracks and houses within the town. But at present the greater part of the population is considerably above the level of these fountains, and the water has to be carried up to the houses by manual labour. The quantity yielded by the aqueduct is besides only a fractional part of what is required for the garrison. It has been proposed to increase the quantity by directing a larger amount of rain-fall into the mass of sand, and by stopping up some of the outlets through which it escapes to the sea. This plan, which has been in successful use for centuries in Gibraltar, was one of the methods suggested by the General Board of Health for the water supply of the metropolis.

In the Appendix No. 4, will be found lists of all the tanks and wells, military, naval, and civil, within the garrison. They receive water partly from the surface, partly from subsoil infiltration, and partly from roofs. The aggregate tank capacity, if correctly given, represents a storage of about 6,000,000 gallons for the civil population. Every new house erected must have a tank to store the rain water falling on the house, so that the amount of storage is gradually increasing. The existing military and naval tanks have a capacity of nearly 3,000,000 of gallons, to which tanks to hold 1,600,000 gallons are in course of being added by the military authorities, and for 2,000,000 gallons by the naval authorities. Of these new military tanks, one for 1,500,000 gallons is at the Moorish Castle above the town. The naval tank is at a considerable elevation, and both tanks would distribute water by gravitation over the whole town and to most of the barracks. Many of the existing tanks are in such positions as to be exposed to impurities from the surface or from the subsoil; and none of them appear to have any means of filtering the water before it enters them, although filtration is absolutely indispensable wherever water is collected in this way.

A number of barracks and quarters are partly supplied from wells, draining a very suspicious sandy subsoil more or less charged with noxious impurities.

Another and a very important source of water for the garrison is a well already mentioned on the Neutral Ground outside the lines, from which there is a constant traffic in water carried on to the barracks and houses. But this water source cannot be trusted to, as it would be cut off in the event of a siege.

With the view of determining the present quality of the water, and the direction in which the supply should be extended, we had specimens sent home for analysis from all the main sources, namely, the Neutral Ground well, the old aqueduct, tank water, and well water taken from the flat part of the town. The results are given in a report in Appendix No. 5, by Mr. Abel, which shows the great advantage of submitting water sources to this kind of examination. The following table gives the composition of each water in grains per gallon:—

| | Neutral Ground Well. | Aqueduct Water. | Tank Water. | Town Well Water. |
|---|---|---|---|---|
| Sulphate of lime | 4·56 | 12·49 | 1·55 | 15·16 |
| Nitrate „ | 6·22 | 16·01 | 0·83 | 49·63 |
| Carbonate „ | 12·24 | 17·04 | 0·94 | — |
| Carbonate of magnesia | 5·67 | 15·27 | 36·33 | 10·98 |
| Nitrate „ | — | — | — | 7·11 |
| Alcaline chlorides, (sodium and potassium) | 7·48 | 28·59 | 3·59 | 80·24 |
| Organic matter | 4·06 | 9·94 | 5·02 | 7·70 |
| Ammonia | slight trace. | slight trace. | trace | slight trace. |
| Total | 40·23 | 99·34 | 48·26 | 170·82 |

The chemical constitution of these waters is extraordinary, both as regards the amount and character of their impurities, when compared with what are considered waters sufficiently pure for town use. Compare for example the solid contents per gallon of any of them with the amount in the water supplied to Glasgow, which has only 2·35 grains of solid matter per gallon. The Gibraltar waters contain an extraordinary quantity of nitrates, one of them not much less than an eighth part of an ounce to every gallon.

The amount of organic matter is excessive, and there is also an excessive amount of chlorides. The sources of these various impurities differ in the different waters. The well water and aqueduct water must derive their nitrates and organic matter by infiltration from a subsoil saturated with sewage.

The chlorides in the wells indicate the presence of sea water. In the tank water they probably arise from spray. It is less easy to account for the quantity of chlorides

in the aqueduct water unless we suppose that the soil from which the water proceeds contains chlorides.

The inorganic impurities of the tank water probably arise from the geological structure of the rock, or from the building materials: the organic matter is washed in by the rain, but in a properly-constructed tank the organic matter would be of vegetable and not of animal origin, and it could be prevented from entering the tanks by filtration.

The results of the analysis clearly indicate which waters should be disused, and from what source the future extended supply should be obtained.

Wells situated in the flat district of the town are quite unfit for use. The aqueduct water, although largely consumed both by troops and civilians, would not in its present state be a safe water for use during an epidemic. The neutral ground water is not good. By far the best, although somewhat hard, is the tank water. The source from which it is derived is the least objectionable, and ought to be chosen for extending the supply.

In carrying out this principle of supply we recommend that a large catch-water drain, of sufficient depth to collect the largest rain-fall, on the lofty slopes above the town, and cemented most carefully, should be formed in the rock just above the town, and carried from the Moorish Castle to Windmill Hill. It should be currented to supply the various tanks we are about to name, either directly or by large iron pipes leading from the catch-water to the tank.

The upper portion of the rock, from which the water would be obtained, apparently contains four areas, from each of which the water could be conveyed into tanks. These areas are marked A, B, C, and D on the sketch Plan XXI.

The area marked A would supply the tank for 1,500,000 gallons now in progress at the Moorish Castle. The area marked B would supply a new tank. The area marked C might be appropriated to the supply of the naval tank recently constructed. The area marked D would supply a new tank.

Flagged branch drains should be carried up the slopes to convey the surface water rapidly to the catch-water. Useless vegetation should also be removed from the surface where the water is collected.

We have shown on the sketch Plan XXI. the portions of rock this catch-water would drain. Besides being necessary for collecting water, the catch-water drain is essential to prevent the rain-fall from saturating the subsoil of the town. It should be constructed at once. It will be seen that below the level of the drain, and between it and the town, there are portions of the upper part of the rock from which the drain could not intercept the rain-fall. The water from these slopes should be at once cut off from the subsoil of the town by a deep drain, and conducted to a main sewer. Overflows into the town drains, and where not over the town, direct to the sea, should be provided, for all water which the tanks cannot contain.

The steepness of the rock and the hard material of which it is composed would render the construction of tanks at an elevation as a rule difficult and costly. His Excellency Sir William Codrington suggested a large gully at Buena Vista as a good locality for a large tank. The bottom of the gully is above the level of the majority of houses in the town. The examination we made of the locality leads us to believe that water could be led to it from the areas B and D above mentioned. If upon a further examination of the levels and the locality the accuracy of this view should be established, and the size should prove sufficient, the gully in question would appear to offer an economical and advantageous site for a tank to stow the whole of the additional supply required. The saving in first construction which would result from the adoption of this arrangement would compensate for any expense which might be occasioned from the necessity of pumping a small portion of the supply to higher levels, such as Windmill Hill.

The rain-fall from the area marked B would be brought by a line of iron pipes commencing either at the south demi-bastion or at Charles V. wall, and following generally the line indicated on the plan.

Considering the peculiarities of the rain-fall of Gibraltar, it would be desirable to make provision for removing a fall of rain of not less than one inch per hour, of which it may be assumed that one-half will at once pass off into the catch-water. Taking the north area at about 60 acres, this would require a pipe of three feet diameter, with an inclination to give a velocity of not less than five feet per second.

The whole of the details of the arrangement would require careful consideration on the spot. Before flowing into the storage tanks, the water should be passed through filtering tanks, of the construction shown on Figs. 1 and 2, to prevent impurities from entering the storage tanks. The main tanks should be covered to prevent vegetation in the water, but the covering might be of such light materials as might be found most economical. From the tanks pipes would convey the water over the rock.

The area from which the catch-water drains will intercept water is above 130 acres in extent. The steepness of the surface is favourable to the water flowing off rapidly; but, on the other hand, the surface is intersected by crevices containing earth and vegetation, which would absorb a certain amount of the water. The rate at which rain falls in Gibraltar is frequently so great that a large part of it would be collected in proportion to the amount lost by evaporation or absorption. Under these circumstances we consider it safe to assume, except in peculiarly dry years, 30,000,000 gallons for the supply from this area. Gibraltar town is said to contain about 14,000 inhabitants, the garrison would, we are informed, be reckoned at 7,000 in time of war, so that provision must be made for 21,000 persons. The amount of water which could be furnished by the rain-fall will not suffice for all purposes, including waterclosets and flushing drains. We, therefore, consider that for such purposes it is essential that a brackish or sea-water supply be obtained; this has already been proposed and adopted for some of the barracks. Sea water, if it can possibly be avoided, should not be used for washing or watering the streets or yards; it dries very imperfectly, and, when in contact with organic matter, it readily enters into decomposition. The water (obtained either direct from the sea, or from a well near the sea, so as to have it as free from salts as possible,) would have to be pumped up into tanks placed above the town and on other parts of the rock where required. Iron tanks would probably be least expensive. Two tanks of 10,000 gallons each for the town, and two in convenient localities for the south, Windmill Hill and Europa, would suffice. The water should be generally distributed and laid on to waterclosets and latrines in every house and barrack, so as to afford the means of washing out all the drains. The engine which has already been erected in the south district is calculated to raise 30,000 gallons daily to the height of 250 feet, an amount probably sufficient for the purpose, but a second engine would be required to provide against accidents. To preserve the health of the troops during a siege, the arrangement should of course be as available then as in times of peace, hence it is necessary that the engine should be placed in a bomb-proof building and beyond the reach of direct fire; it might therefore be necessary to remove it from its present position. This, however, would be a matter for the consideration of the Governor and commanding Royal Engineer.

Provided this arrangement be adopted, we think that from four to five gallons of fresh water per head for the population and garrison may be assumed to suffice for all purposes, except for waterclosets and drainage, although no doubt a larger supply would be preferable. The population of 23,000 would require on the higher estimate about 33,700,000 gallons per annum, of which an eight months' supply, or say 22,500,000, gallons would require to be stored to last during the months when there is little or no rain. Of this it would appear, from the information with which we are furnished, that—

| | |
|---|---|
| The civil population have tanks to contain - - | 6,000,000 gallons. |
| The military to contain - - - - | 3,000,000 „ |
| The military authorities have tanks projected or in execution to contain - - - - | 1,600,000 „ |
| Total - - | 10,600,000 gallons. |

The naval tanks for 2,000,000 gallons are not included in this estimate.

The private tankage of the civil population, amounting to 6,000,000 gallons, will contain about one gallon per day per head of that population. We therefore consider that for the present it will suffice to provide the civil population with an additional supply of three gallons per head from the public tanks, which amount might be increased at a future time, as additional tanks are constructed. Upon this basis the additional storage room for water which is required is for about 13,000,000 gallons. An attentive study of the various sites in which tanks could be constructed has led us to the opinion that the site suggested by his Excellency Sir W. Codrington in the gully at Buena Vista and a plateau behind Windmill Hill Barracks would be the most eligible sites for these additional tanks, as they would be sufficiently elevated to distribute the water to a considerable area by gravitation. The few special localities above the levels of the tanks would be more economically supplied by pumping than by the construction of large storage tanks at the necessary elevation. A detailed survey will be required to ascertain whether the Buena Vista gully contains the space necessary for storing the additional supply.

These large tanks in elevated positions must be constructed by degrees, and thus an opportunity will be afforded of ascertaining what are the limits of the water supply and

the demand of the population. Loss of water by holes and crevices can be diminished or prevented by turning the rain-fall away from them by small catch-water drains. But if the loss were found to be very considerable from general porosity of surface, which is unlikely, the only thing to do would be to flag as much of the surface as necessary. A flagged surface would yield from two to three times the amount of water which an unflagged surface would yield. The object to be aimed at is to obtain at least four or five gallons a head per day of soft water for the entire population and garrison. For flushing drains, and for supplying waterclosets and latrines, sea-water, thrown up by a steam engine, will be available. The soft water should be delivered daily by pipes into house cisterns of dimensions sufficient to contain a daily supply for each house, to be paid for by a general rate. A police inspection of the cisterns would be necessary to check waste and to see that the cisterns were kept clean and in good repair. Salt water for latrines and waterclosets should be laid on throughout the town, but no house cisterns would be required for it. Central tanks placed at convenient positions above the town, and above the south district, from which this water could be laid on by gravitation to each house, would be sufficient. A rate would have to be levied to pay the cost. In apportioning the cost, Government would of course be rated for the supply of its establishments.

4. Paving.—The public paving and surface drainage are generally good. In a number of streets or parts of streets stone is used, and in other parts the surface is macadamized. All the roads are of the latter construction and are kept in good repair; but they are very dusty in dry weather. The main defects in paving and surface drainage which came under our observation are those already mentioned in courts and passages within houses. Nothing can well be worse than are some of these. There are some vacant spaces of ground also, which are private property, and are not kept in good order. Over all such places the Commissioners should have direct control, as local Boards of Health have at home.

5. Cleansing.—The whole of the town refuse is at present collected daily by the scavenging department and removed to the sea beach on the east side of the neutral ground, to a sufficient distance from the garrison.

The public slaughtering places are also in the same locality, and the offal is deposited on the shore. No nuisance arises to the garrison from the present practice.

Summary.—The following is a summary of the sanitary defects of the town:—

1. Bad construction of dwelling houses, interfering with light and ventilation. Dampness of many houses on account of position.
2. Defective public drainage.
3. Private drainage very bad, or none.
4. Surface drainage, paving, and sometimes cleansing of private courts and passages, very bad.
5. Filth inside houses. Filthy unwashed walls and ceilings.
6. No proper soil-pans or other suitable domestic conveniences. Present arrangements most offensive and dangerous to the public health of the garrison.
7. Water supply bad, deficient, and costly.

There is no remedy for this state of things at present, so far as concerns the houses, for the authorities have no power except over the cleansing of the courts. It is a matter of absolute necessity for the safety of the town that powers of entry on all premises should be granted, and of compelling drainage, flagging, water supply, the construction of proper soil-pans or latrines supplied with water, in addition to the cleansing of houses, before any real sanitary improvement can be effected. Powers similar to those in the Public Health Act would suit the purpose, and should be applied by Order in Council.

The present sanitary powers are lodged in a body of Commissioners and Surveyors of highways, named by the Governor. Their duties are given in the Commission (Appendix 9). They relate chiefly to paving, repairing, lighting, and cleansing of public streets and other *public places*, and making and repairing public sewers and drains. The expenses are provided for by rates known as the "paving and scavenger's rate" and the "rate for lighting," levied by another Commission. This rating Commission is also appointed by the Governor, under an Order in Council (Appendix 10)

The powers, such as they are, belong to a state of sanitary legislation which has been found altogether insufficient for protecting the public health, especially in overcrowded districts, and it is absolutely necessary that the additional powers alluded to above, and for levying private improvement rates, should be granted.

To remedy these defects, and to provide for the better health of the garrison, we recommend,—

1. That an Order in Council be issued to enable the Governor to extend the powers of the local Commissioners over private courts, passages, and dwelling houses: to compel drainage, paving, and household water supply (soft water for domestic use and salt or brackish water for waterclosets and latrines), the limewashing and cleansing of filthy houses, to provide waterclosets or water latrines, and to levy private improvement rates, besides rates for public purposes. All plans of houses, to be built in future, to be referred for sanction to the same Commissioners.

2. That to improve the town drainage an intercepting catch-water drain of ample dimensions, carefully cemented, be cut in the rock from above the Moorish Castle to Windmill Hill, to prevent the water which falls on the upper part of the rock from passing into the inhabited areas below.

That so much of this water as is not stored for a fresh-water supply be carried direct to the sea through the town or other drains.

That the intercepting sewer proposed by the commanding Royal Engineer, for preventing the sewage of the upper districts of the town from passing into the lower districts, be constructed with an outfall at the Ragged Staff, as shown in Plan XXIV.

That the main sewers be reconstructed, and glazed pipe drains introduced for the smaller drainage where practicable.

That all sewers which come from the upper part of the town be ventilated by their upper ends being carried into shafts raised to 20 to 30 feet at least above the level of the highest neighbouring houses.

That the drainage of the lower part of the town and of the barracks adjacent to the line wall be carried direct to the sea.

3. That the water supply be extended by providing sufficient tank space to hold the water collected by the catch-water drain already mentioned, except during exceptionally wet years. That for drainage purposes a supply of salt or brackish water be provided by pumping into tanks and distributing it especially for this object. The soft water to be separately distributed for other domestic purposes.

Lastly. We consider it necessary that a medical officer of health should be specially charged with attending to the sanitary condition of the garrison, including the civil population: reporting all defects to the Governor in terms of the New Medical Regulations.

## SECTION II.—SANITARY STATE OF THE TROOPS.

### 1.—Diseases among Troops in Garrison.

All the information we require as to the past sanitary state of the troops at Gibraltar is contained in the reports on Sickness and Mortality in the Army, prepared by Sir Alexander Tulloch and Dr. Balfour, extending from the year 1818 to the present time. From their reports we learn that for the group of years 1818-36 the annual admissions to hospital per 1,000 strength were 996, and the deaths per 1,000 were 21·4. The chief fatal diseases were fevers, the annual mortality from which amounted to 9·3 per 1,000; chest diseases, which yielded a mortality of 5·3 per 1,000, and cholera, from which the mortality was 2·3 per 1,000. The following abstract gives the nature of the fevers, with the number of admissions and deaths from each form for the entire period:—

| Fevers, 1818–36. | Total admissions. | Total deaths. | Fevers, 1818–36. | Total admissions. | Total deaths. |
|---|---|---|---|---|---|
| Quotidian intermittent - | 174 | 5 | Synochus - - - | 517 | 13 |
| Tertian „ - | 124 | — | Typhus - - - | 30 | 10 |
| Remittent fever - - | 314 | 28 | Yellow fever { epidemic - | 1,522 | 423 |
| Common continued - | 7,002 | 83 | Yellow fever { non-epidemic - | 4 | 1 |

This table, interpreted by the light of our present knowledge, shows the influence of bad water, of drainage both bad in character and deficient in extent, of overcrowding, and bad ventilation of barracks.

The table includes the epidemic yellow fever of 1828, which first appeared in the most overcrowded and filthiest part of the town, and then spread all over the rock; those only escaping who took timely refuge on the neutral ground.

The cholera epidemic of 1834, first appeared among the troops in King's Bastion, the worst barrack in the garrison. The troops in the crowded unventilated wings of the South barracks also suffered severely on that occasion.

The next group of years given in the reports is from 1837 to 1846, during which the annual admissions were 939, and the annual deaths 13·6 per 1,000, showing a very considerable reduction in the mortality. During these years some improvements had been carried out in drainage. The ventilation of casemates had been improved, some stone floors boarded, and improved means of personal cleanliness supplied.

The admissions from fever had fallen from 161 to 81 per 1,000, and the fever deaths from 9·3 to 1·96 per 1,000. The reduction in the total mortality was almost entirely due to diminution of fever and the absence of fever epidemics. The mortality from chest diseases was about the same as during the previous group of years. The following table shows the nature of the fevers:—

| Fevers, 1837–46, 10 years. | Total admissions. | Total deaths. | Fevers, 1837–46, 10 years. | Total admissions. | Total deaths. |
|---|---|---|---|---|---|
| Quotidian intermittent - | 130 | — | Remittent fever - - | 15 | 3 |
| Tertian „ - | 7 | — | Common continued fever | 2,444 | 41 |
| Quartan „ - | 6 | — | Typhus - - - | 56 | 21 |

There are no means of comparing the sanitary state of the troops from 1847 to 1858. But the first annual report of the Army Medical Department gives the following result for the year 1859. During that year the admissions to hospital were in the ratio of 949, and the deaths 7·76 per 1,000 strength. The causes of mortality are given in Appendix No. 11, which shows that 50 per cent. of the mortality arose from miasmatic diseases.

The nature of the fevers is given in the following table:—

| Fever, 1859. | Total admissions. | Total deaths. |
|---|---|---|
| Intermittent - - - - | 15 | — |
| Typhus - - - - | 2 | — |
| Continued - - - - | 552 | 15 |

It is evident from an examination of these data that the important diseases at Gibraltar are those of the miasmatic order, especially fevers, and also tubercular diseases; the following table, taken from the Army Medical Report, 1859, shows a material increase in the mortality from fever, as compared with the years 1837–46.

| | 1859. | | Annual ratio per 1,000. | | | |
|---|---|---|---|---|---|---|
| | | | 1859. | | 1837–46. | |
| | Admitted. | Died. | Admitted. | Died. | Admitted. | Died. |
| Eruptive fevers - - - | 19 | 1 | 3·63 | ·19 | 1·63 | — |
| Paroxysmal fevers - - - | 15 | — | 2·91 | — | 5·85 | ·09 |
| Continued fevers - - - | 554 | 15 | 107·51 | 2·91 | 75·46 | 1·87 |
| Dysentery, diarrhœa, and cholera - | 389 | 4 | 75·49 | ·78 | 145· | 1·18 |
| Sore throats - - - | 89 | — | 17·27 | — | 14·82 | — |
| Ophthalmia - - - | 255 | — | 49·48 | — | 70·54 | — |
| Rheumatism - - - | 143 | — | 27·75 | — | 41·26 | ·06 |

The fever of 1859 appears to have been specially connected with overcrowding and bad ventilation, for it increased in proportion to the increased strength of the garrison; other local causes remaining the same.

We have attempted to obtain the statistics of individual barracks, but without success, on account of the frequent changes and varying occupation to which they are subject. The only data we have been able to obtain are from a table supplied to us by Deputy Inspector-General Paynter, giving the statistics of an attack of cholera which occurred in the year 1860, showing that the intensity of the disease in the barracks was in the following order, beginning with the one most severely affected:—Grand Casemates, South Barracks, Windmill Hill, Buena Vista, Europa, and Rosia.

The statistical data show that the troops suffer from the same classes of disease and from the same general causes of unhealthiness as the civil population.

## 2.—Local Position of Barracks.

We next proceed to consider the general sanitary condition of the barracks and hospital, reserving the details of each building to the subsequent part of the report.

The following is a list of the barracks on the rock, together with the regulation number of men in each, and the number which each barrack ought to contain:—

| North District. | Regulation Number of Men in each Barrack. | Number which each Barrack should contain. | South District. | Regulation Number of Men in each Barrack. | Number which each Barrack should contain. |
|---|---|---|---|---|---|
| 1. Grand Casemates - | 1,166 | 710 | 10. Jumpers Bastion - | 192 | 120 |
| 2. Orange Bastion - | 160 | 80 | 11. Rosia Casemates - | 72 | 36 |
| 3. Prince Albert's Front - | 114 | 79 | 12. South Barracks - | 696 | 480 |
| 4. King's Bastion - - | 256 | 128 | 13. Rosia Barracks - | 549 | 494 |
| 5. Wellington Front - | 533 | 393 | 14. Buena Vista Barracks - | 416 | 320 |
| 6. Moorish Castle - - | 80 | 54 | 15. Windmill Hill Barrack - | 402 | 170 |
| 7. Gunners Barrack - | 24 | 20 | ,, Artillery - | 22 | 22 |
| 8. Town Range - - | 320 | 192 | 16. Europa Defensible Barrack | 100 | 92 |
| 9. Hargreaves Barrack - | 131 | 94 | 17. Brewery Barracks - | 110 | 85 |
| | | | 18. Europa Huts - - | 384 | 384 |
| | | | Total - - | 5,727 | 3,953 |

The positions occupied by these barracks vary most materially as regards their sanitary relations. The first five barracks in the north district, and the first two in the south district are on sites very little raised above the sea level. Several of them are almost on that level, and the floors and barrack yards are more or less damp at all times, but especially during the prevalence of the rains. Orange Bastion, Prince Albert's Front, King's Bastion, Wellington Front, Jumpers Bastion, and Rosia Casemates are within the line wall, which retains such part of the filth, drainage, and rain-fall in the subsoil as cannot escape by the sewers. From their local position free external ventilation is next to impossible with these barracks. They generally open out of narrow courts surrounded by high walls, or they are over-topped by the houses of the civil population, or there is a high wall a few feet from the doors and windows in front. With few exceptions the rooms have no openings except at one end, and altogether the line wall casemates are among the worst we have anywhere seen as regards their local position. That they are not more unhealthy is attributable to the fact that they have the advantage of the surrounding sea air. Their position is of course unavoidable, but much may be done to render it less unfavourable to health than it is at present.

Barracks, such as the Town Range and Gunners barracks, situated among the houses of the town, are exposed to the same stagnation of air and bad drainage as the houses are.

Barracks situated on the higher levels ought all to be healthy, so far as local position is concerned. They are removed from every unavoidable source of impurity, and any local unhealthiness experienced in them is due to a bad use having been made of the ground, such, for example, as placing the barrack too close to the rock, bad construction, or to some removeable defect.

In low-lying, imperfectly-drained, close situations there are barracks for 2,493 men, where there is available space for only 1,546 men; among the houses of Gibraltar there are barracks for 344 men, with sufficient space for no more than 212 men; and on healthy positions of greater or less elevation there is accommodation for 2,890 men, where only 2,195 ought to be placed.

### 3.—Construction of Barracks.

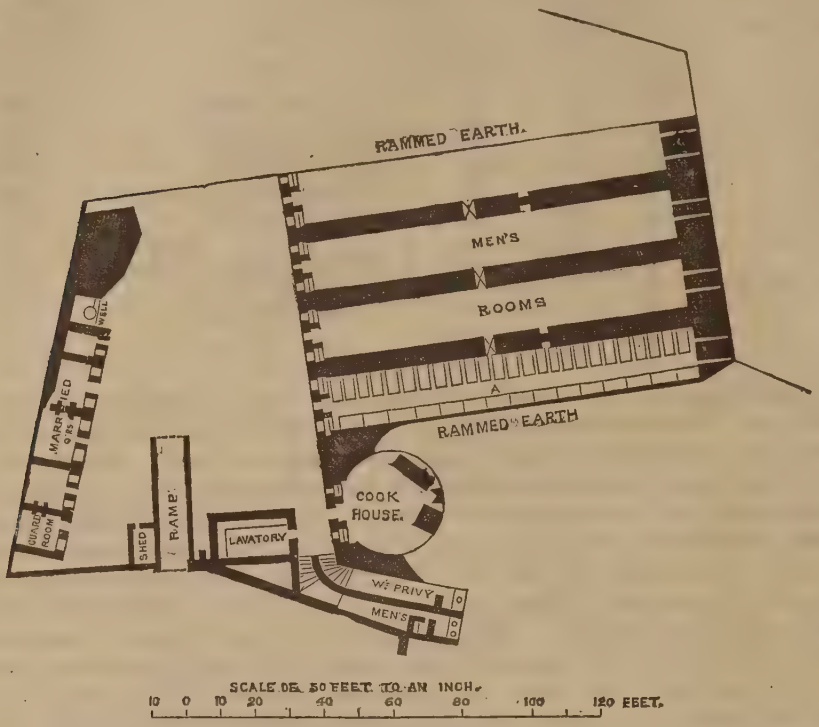
More than half the garrison is lodged in casemated buildings, and all the barracks in unhealthy situations are casemates. Three blocks of building, the Grand Casemates, Buena Vista, and Europa Defensible barrack, are detached from the works, and have doors and windows at opposite ends. All the other casemates are in bastions or curtains, and consist of arches, the axes of which are at right angles to the line of the wall. These have doors and windows only at one end, and at the other end there is a blank wall in the majority of cases. In some rooms there are small loopholes 5 or 6 feet from the ground, or a small shaft has been carried up in the back wall to afford some degree of ventilation; but the rooms are nevertheless mere receptacles of foul air, dark, damp, and unwholesome.

One or two illustrations of their construction will show the influences to which the men are exposed in these casemates.

Fig. 3 gives a plan of the casemates in Orange Bastion, a work not of recent date. These casemates are much below the surrounding levels, and are ventilated only from a small, confined, ill-paved and damp court in front. There is no possibility of obtaining a thorough draught of air, and they are so crowded that the beds, as shown in the sketch, nearly touch each other along the wall on one side, while they actually touch each other

along the opposite wall. It is quite evident that the probable effect on health of this form of construction never received a moment's consideration.

FIG. 3.—ORANGE BASTION CASEMATES.

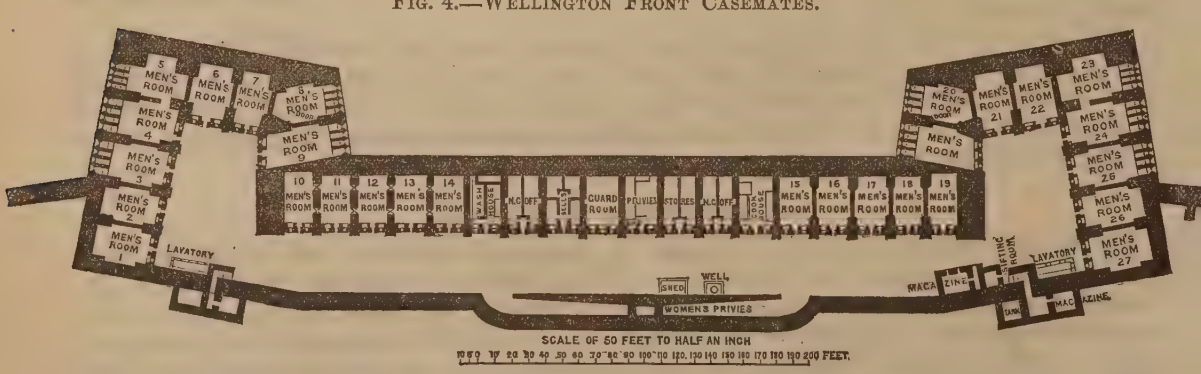



NOTE.—The part marked A shows the number and arrangement of the cots in each room (40 men). The width of the rooms is 14 feet, and the length 105 feet.

A plan of Wellington Front casemates is shown in Fig. 4. This is a recent work, and is the best of its class in Gibraltar. There is, however, the same sunk area, with the impermeable wall outside, and the ventilation coming only from the sunk court in the great majority of rooms.

But the casemates are much shorter than in the other example, Fig. 3. In a number of rooms there are loopholes to the sea, which although too small to be of much use are better than a blank wall, and there are air shafts for ventilation not shown in the figure.

FIG. 4.—WELLINGTON FRONT CASEMATES.



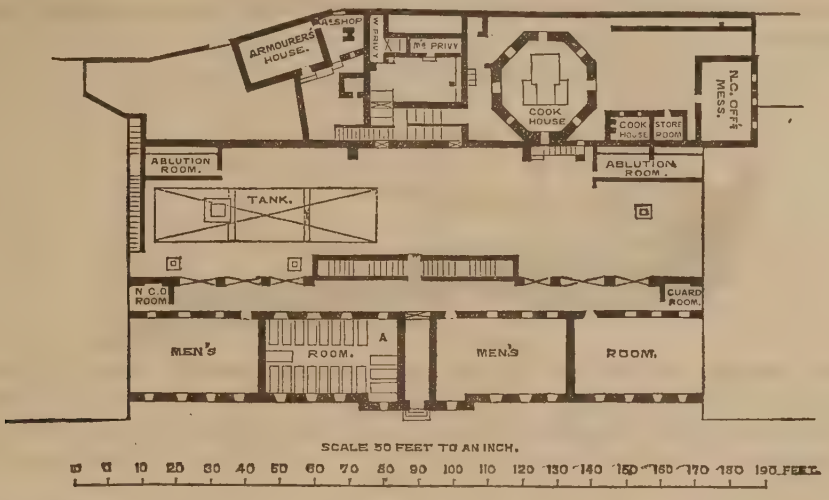

NOTE.—The walls between Nos. 1 and 9, and 15 to 17 are carried up to the spring of the arch, leaving space for ventilation between the spring and crown of the arch of one room into another room, also inhabited.

The floors of all the casemates are of stone, at or below the level of the ground, and they are all more or less damp. The floors should be raised on walls with free ventilation beneath, and they should be boarded over.

Barracks, not of casemated construction, differ in their arrangements. We have selected two of these as illustrations. The first is a part of Town Range barrack shown in Fig. 5. The only level ground about this barrack is a narrow street in front, and the narrow court yard behind. All the outbuildings shown in the sketch are on higher ground, and the rock rises with a very steep inclination to a great height behind. Offensive gulley grates open into the court yard close to the barracks. The rooms have a great advantage as regards health in having windows on both sides, but they are greatly overcrowded, as is shown on the sketch, by the position of the beds. The

situation is close and badly ventilated, as well as badly drained, and this barrack has yielded numerous fever cases.

Fig. 5.—Town Range (Left Wing).

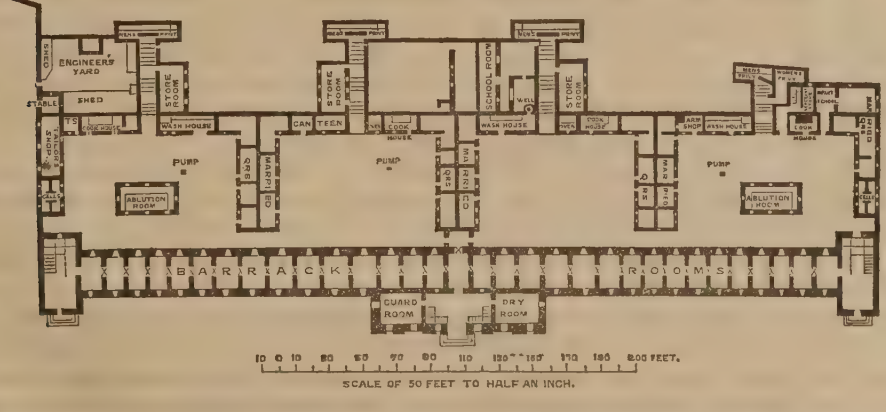



Note.—The part marked A shows the number and arrangement of cots in each room for 20 men.

The locality is not one in which a large number of men should be barracked together, but still it may be rendered much more healthy by better drainage and ventilation, by putting an end to overcrowding, and by providing wooden floors instead of stone for the lower-story rooms. At the time we were in the rooms the stone floors were soaked with wet.

The next illustration (Fig. 6) is a ground floor plan of South barracks, a large building occupying a healthy position, and nevertheless yielding a considerable per-centage of fever cases among its occupants. It is fully exposed to the sea along the front, and there is a wide court yard between the back and the rock. But this court yard has been rendered almost useless for the ventilation of the lower floor by being in the first place closed at the ends by other buildings, and by having three lines of married quarters built across it like traverses, as if to prevent the air from circulating. The construction of the rooms is extraordinary. They are partially divided by piers and arches, the effect of which is that each wall obstructs the circulation of air, while there is a community of foul air throughout the building, partly by the arches, partly through the floors. There is no ventilation except the windows are kept open, and there is very considerable overcrowding. The ground floors are below the level of the court yard behind, and have no circulation of air beneath them, instead of being a foot at least above the ground, with ventilation beneath ; and they are of stone instead of wood.

Fig. 6.—South Barracks.

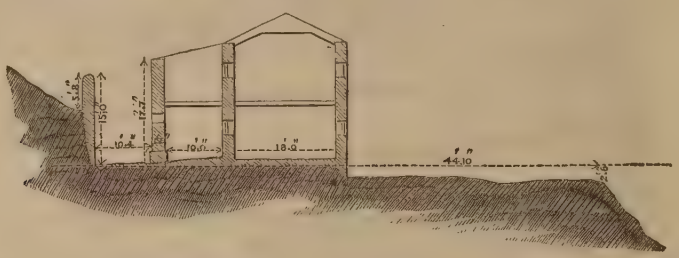



In this instance the defects in construction, want of ventilation, and overcrowding, are quite sufficient to account for the fact that if any epidemic disease is about, the troops in these barracks are tolerably certain not to escape it.

Windmill Hill barracks, although occupying a very healthy site, are badly constructed. They are deficient in window space and have their verandah placed on the north side,

where there is no sun, while the south side is quite unprotected. They are, moreover, placed as close to the lofty rock behind as they could well have been, and the ventilation is much obstructed by these errors of construction. Fig. 7 shows the position of this barrack with regard to the rock, its verandah on the wrong side, and the probable effect of both errors in preventing that free ventilation required where a number of men are massed together.

Fig. 7.—Section through Windmill Hill Barracks.



The best barracks on the rock are the new huts at Europa, which embody correct principles of sanitary construction. We have described them elsewhere. With a few improvements in detail they would leave little to desire as regards health. The materials used are limestone, quarried from the rock, lime, and timber. They occupy a plateau freely exposed to the sea-breeze, and afford sufficient space for the men.

There are a number of very bad and ruinous Crimean wooden huts on the neutral ground, and on Windmill Hill, occupied by troops and as married quarters, which ought to be pulled down as soon as better accommodation can be provided.

These examples will give a general idea of the nature of the barrack accommodation, the details of which will be more fully given in the subsequent section of this report.

### 4.—Cubic Space and Superficial Area per Man in Barrack Rooms.

The table, Appendix No. 12, gives the number of men in every barrack for every 50 cubic feet, and for every 10 superficial feet, from 250 to above 600 cubic feet, and from 20 to above 60 superficial feet per man.

The following abstract contains the results :—

| Cubic Feet. | | | | | | | Superficial Feet. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 250 to 300. | 350 to 400. | 400 to 450. | 450 to 500. | 500 to 550. | 550 to 600. | Above 600. | 20 to 30. | 30 to 40. | 40 to 50. | 50 to 60. | Above 60. |
| No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. |
| 402 | 927 | 2,288 | 632 | 843 | 572 | 63 | 446 | 4,807 | 440 | 22 | 12 |

This table shows a great degree of overcrowding in most of the barrack rooms in the garrison. It appears from it that no more than one-tenth of the men have the amount of space allotted by regulation to troops at home stations; the remaining nine-tenths all occupy overcrowded barrack rooms, and for one half of the men the crowding is excessive. This prime agent in the production of continued and typhoid fevers therefore, exists within the garrison, and to such an extent that nothing short of increasing the barrack accommodation, or diminishing the number of troops will diminish materially their liability to febrile disease. The question of overcrowding involves the most difficult of all the sanitary problems relating to this garrison. The space for barracks is limited, and considerable bodies of troops have to be located within very circumscribed areas. But, notwithstanding this, the barrack accommodation admits of being gradually extended to afford healthy space for the men.

The amount of cubic space per man must be determined with regard to local circumstances. The fact of the rock being nearly surrounded by the sea, and fully exposed to the sea-breeze, is a great element of health. It is this, indeed, which gives such comparative immunity from epidemic disease under the very unfavourable sanitary conditions which the garrison presents. For all positions, except along the line wall, 600 cubic feet per man would probably be sufficient. As regards the line wall casemates, the only remark we have to make is, that the fewer men placed in them the better, and that Orange Bastion and King's Bastion are scarcely fit for human habitation. The casemates, in short, should be as little used as possible, except for emergency.

In a preceding page we have given a list of all the barracks on the rock, together with the number of men accommodated in each by existing regulation, and also the numbers which each barrack ought to contain. The estimate of accommodation we have there given for the casemated barracks is based on their local position and on the nature of the sanitary defects, removeable as well as irremoveable, presented by each barrack. In the better class of buildings we have assumed 600 cubic feet per man as the amount of space required for health. The total regulation accommodation is at present that for 5,727 men. Our estimate of what is necessary for health reduces this number to 3,953 men, which is the largest number the buildings ought to contain.

Barrack rooms which would, if otherwise fit, have contained about 300 men at 600 cubic feet per man were occupied at the time of our inquiry by the families of married soldiers, a fact which shows the need of separate accommodation of this class being provided with as little delay as possible in buildings specially constructed for the purpose.

It would appear that accommodation for 1,774 men should be added to that already existing to maintain in a healthy condition the number of troops for which there is at present regulation accommodation within the garrison.

The Governor and Commanding Royal Engineer should be requested to consider, in connexion with the improvements in existing barracks detailed in this report, in what manner any of the barracks could be extended. The accommodation which could not be so provided by extensions would required to be supplied by the construction of new barracks.

The extensions of existing barracks should be devised with peculiar care, in order not to interfere with the sanitary condition of the buildings.

The sites for new barracks should not be fixed upon military considerations alone, but the most healthy sites should be adopted. The Moorish Castle Barrack might be added to to a small extent with advantage as a sanitary measure. The most favourable arrangement for the health of the troops would probably be to extend the existing barrack at Windmill Hill, and if possible to build near it a part of the additional accommodation required. The number of huts at Europa Flats might be increased, especially as cooking arrangements have been already provided there for double the present number of men.

The general principles upon which such additions should be constructed have been already described in Part I. of this report, and are shown on Plans I., II., and III.

If the additional accommodation were provided in casemates, the casemates should not exceed 40 feet in length, and should have direct communication at both ends with the outer air; large windows at one end, a fire-place with ventilating grate, other ventilation by shafts and inlets, and a night urinal in the porch or other position such as would prevent smell in the room. In casemates with musketry loopholes, small windows to be covered with heavy loopholed iron shutters in case of war are much healthier than loopholes of the usual construction.

### 5.—Ventilation.

Except in the new Europa huts there are only two barracks in which the ventilation approaches to being sufficient, namely, Rosia barrack, which has louvres and large openings near the roof, and the Defensible barrack at Europa, in which the open airy situation, general structure, and numerous openings in the walls, afford facilities for free circulation of air. In all the casemates along the line wall, as well as in the Grand casemates, the natural means of ventilation by doors and windows are quite insufficient. The amount of window space in proportion to the cubic contents of the rooms is greatly too small. This is now unavoidable, and admits of no improvement, but it affords a strong reason for providing the requisite ventilation by every possible means.

In the greater proportion of the barrack rooms not casemates, the window space is not large enough, and the heads of the windows are not carried near enough to the ceiling. As there is in most cases no outlet above, all the space above the top of the window becomes a receptacle of foul air, which finds its way through the floors to the upper rooms. Any attempts at ventilation have been quite inadequate for the purpose in view. There is no complete system in any room. In a few cases there are outlet shafts too small or too short to be of use, or there are inlets, such as exist at the tops of the windows in Town Range and South barracks, so made as not to open unless the windows are opened, when they are not required, and to be always shut when the windows are shut.

The barracks generally have no fireplaces, and judging only from the temperature of the climate, none might be considered necessary; but during the rainy season, the air is so saturated with moisture, that every place, especially the casemates, becomes more or less damp, and at such times a fire becomes very necessary for health. The want of chimneys is also an important cause of defective ventilation at Gibraltar, and we are of opinion that it is absolutely necessary to supply this want wherever it is practicable to do so, at least in the casemates. The introduction of the new ventilating fire grates would enable a smaller quantity of fuel to suffice than with the ordinary barrack grate, on account of the large quantity of warm dry air these improved grates throw into the room. They would make a material difference, both in the dryness of the rooms and in the purity of the air, and smaller sized grates, with a smaller allowance of fuel (issued during December and January), would answer than at home for the same cubic contents.

All the barracks should be at once ventilated by shafts for removing vitiated air, and by inlets for supplying fresh air. The sectional area of the shafts and inlets, together with the principles on which they should be constructed, will be found in the first part of this report, and in Plans X. and XI.

In the South barrack, the rooms of which are divided into compartments by arches and piers, every compartment requires an outlet shaft on one side and an inlet for fresh air on the opposite side, and these inlets should be placed on the side of the barrack rooms facing the sea, to receive the benefit of the sea breeze. By such an arrangement alone can the very singular structural defects of this barrack be in any way compensated for, unless the whole interior were pulled down and altered.

The best form of ventilation for upper-floor rooms, huts, guard rooms, chapel-schools, and similar buildings, without ceilings, is by louvres or louvred turrets in the ridge, together with inlets for fresh air along the eaves, or Muir's, Mackinnel's, or Watson's ventilators would answer.

The circumstances presented by the structure, local position, and facility for external ventilation of the various classes of barrack accommodation on the rock differ so much that it is impossible to state precisely the amount of outlet or inlet area required in each case. We have recommended as the rule openings twice the area for the same cubic space laid down in our General Report on Barracks and Hospitals at home, and to provide against exceptional seasons and peculiarly exposed positions, each opening should have a valve to contract the area, but not to close it, in any room where the ventilation is found to be more than required for health. In this, as in other cases, the medical officer is held responsible for the state of the ventilation by the New Medical Regulations. The principles of ventilation are very simple, but serious errors have been made at home in applying them in detail; we would, therefore, suggest that Mr. Roberts, C.W., should be sent out temporarily to explain the details af the arrangements we recommend.

### 6.—Ablution and Bath Accommodation.

The means of personal cleanliness are deficient in all the barracks except in the new Europa huts.

The ablution arrangements are of a very primitive kind,—merely a small room, or a shed with a bench of stone or wood for basins to stand on, no water, except what is carried by hand, and no baths. In several barracks, as for instance, in the Grand Casemates, there is no ablution accommodation at all, and the men have to wash in the ditch or under an archway, which is at the same time a public thoroughfare. In King's Bastion they have to wash in the barrack yard. There are bathing parades from all the barracks, which are very necessary for health, but not sufficient for cleanliness. Salt water does not cleanse the skin like soap and soft water. But on the other hand there is so great a deficiency of fresh water in the garrison, that it would be difficult under the present system of water supply to find means of bathing 6,000 men once a week. Little more than two additional days' allowance per man per week would afford the whole garrison the means of thorough weekly ablution, and this should be taken into account in extending the supply.

All barracks at present unprovided with ablution rooms should be supplied with them without loss of time. Care should be taken not to place them in positions where they could diffuse damp through the rooms occupied by the men.

Fixed basins would give least trouble and use the smallest quantity of water. The amount of accommodation should be in the proportion of one basin to ten men. There should be gratings to stand on; pegs for coats, and benches. Slate slabs should be used in preference to wood.

A bath for every 100 men should be provided in a separate compartment. Water should be laid on to all the basins and baths, and the whole should be properly drained,

lighted, and ventilated. As regards the introduction of baths, it would be desirable, in the first instance, to put up a few on trial to test the capabilities of the water supply. But until the soft water supply has been improved, we recommend that brackish or sea water, with an issue of marine soap, should be used for baths. Plain slate baths are best suited for soldiers' use.

The general arrangements required for ablution and bath rooms in existing barracks are shown on Plans XV., XVI., and XVII.

### 7.—Cook-houses.

The cook-houses vary in construction in different barracks. Sometimes they are in casemates, as in the Wellington Front barracks, and in all such instances it is next to impossible to ventilate them, for even with doors and windows open they are intolerably hot. This is partly due to hot air, partly to radiation from the apparatus, both of which sources of heat are much more sensibly felt in a warm climate like that of Gibraltar than at home. At the Town Range barracks there is a cook-house of an octagonal form, having the boilers arranged round a central shaft, with very free ventilation round it where the shaft passes through the roof. In these cook-houses there is a constant indraught of cooler air by doors and windows; the place is kept at a lower temperature; the construction is well suited for a warm climate, but the flues are rather difficult to keep clean.

Except at the Europa hut barracks all the cook-houses have old pattern boilers and furnaces, together with brick ovens. The arrangements are such as to consume a large quantity of coal without affording the requisite variety in cooking. The apparatus used in each barrack is given in Appendix No. 13.

Europa hut cook-house has been fitted up with one of Benham's cooking apparatus, intended for a barrack for 800 men, but after it was sent out the camp was reduced to 400 men, the remaining huts having been placed at Buena Vista; the apparatus was put up notwithstanding the reduction in numbers, so that it is only required to cook for one half the number of men it was made for. In consequence of this the saving of coal is by no means what it ought to have been. At present 320 lbs. of coal a day are consumed in cooking for 400 men, or nearly 13 oz. per man per day, which is an exorbitant amount.

The present garrison allowance of coal is $1\frac{2}{3}$ lbs. per man, which represents the present consumption in the old pattern boilers and brick ovens.

With properly constructed boilers and ovens all the requisite cooking could be easily done with half a pound of coal per man per diem, which would save 950 tons per annum on a garrison of from 5,000 to 5,800 men; at 27*s.* a ton, this would amount to a saving of 1,280*l.* yearly.

We would propose to remodel all the cook-houses in the garrison, and to substitute the new steel boilers and steel ovens, shown in Plan XVIII.; and to prevent mistakes in putting them up, we recommend that Mr. Roberts, C.W., be directed to superintend the work until completed.

None of the cook-houses are supplied with water, and there can be no good clean cooking without this. Water should be laid on to all of them in connexion with the improved water supply and drainage for the barracks. Dressers, a sink, and a place for coal should be provided in each kitchen. The best arrangements for cook-houses are those embodied in Plan XIX.

### 8.—Women's Wash-houses.

All the arrangements for washing and drying linen are deficient. Most barracks have a wash-house of some sort, but it has no conveniences, except a boiler or two, and no water. It would be a great gain to health to provide suitable washing places, such as those now being constructed at home, having fixed tubs, with soft water laid on, boilers for heating water, a room with tables for ironing and getting up soldiers' linen, and a drying stove of the new pattern for drying it in wet weather. Improved wash-houses on Plan IX. should be erected near each set of married soldiers' quarters.

### 9.—Water Supply.

The remarks we have already made respecting the water supply of houses apply generally to that for barracks. Brackish or sea water will have to be laid on for all latrines and urinals. Soft water will have to be laid on for ablution and bath rooms,

cook-houses, &c. For these latter purposes tanks at sufficient elevations will have to be provided, into which water from the existing barrack tanks can be pumped up, or which can be supplied by gravitation from the higher tanks we have described.

### 10.—Drainage.

The surface drainage of some barracks is very bad on account of the use of rubble stone for paving. This is the worst possible material, and ought to be disused for such purposes. The parade grounds of several casemated barracks are laid down with gravel of broken limestone, a substance which is intolerably dusty in dry weather, and in wet weather retains dirt and renders good surface drainage impracticable.

All the barrack yards should be flagged, and carefully sloped and channelled to trapped gulley grates. This improvement is also required for all narrow spaces of ground behind barracks, such as at the Town Range, South barracks, and Windmill Hill barracks. Where the barrack is isolated like that at Buena Vista, Moorish Castle, or Grand Casemates, the ground should be flagged along the sides to afford a clean pathway in wet weather, and to turn the rain away from the walls. Where the earth is higher than the floors, it ought to be cut away so as to have a flagged slope and channel a foot at least below the level of the floor.

As regards the general barrack drainage, it partakes of the defects of the town and house drainage we have already described. There are many bad drains. In one such case at the Moorish Castle, the filth oozes through the side of the drain on the face of the hill. Some drains are many times too large for the water they have to convey away. In other cases they get choked from want of fall and want of water. The outlet drains passing through barrack yards in the line wall are burst up by the first heavy shower of rain, flooding the barrack yards, because they have become literally choked with filth during the dry season.

The drainage of every barrack requires to be carefully examined, described, and entered on a plan. Built masonry sewers are required for no purpose in a barrack, and should be replaced by well-laid glazed pipe drains of sizes properly adjusted to the maximum rain-fall. Every ablution room, bath, cook-house, wash-house, latrine, and urinal should be drained, and there should be means provided for flushing out all the barrack drains, a duty which should be regularly attended to.

### 11.—Latrines.

The latrines usually consist of deep troughs communicating with a drain, and washed out more or less effectually by throwing water into them, but there is no water laid on. Sometimes there is no drainage, only a cesspool emptied periodically, usually at a very considerable cost. The latrines are extremely noxious and offensive, and very likely to be injurious to the health of the men during the prevalence of epidemic diseases. Certain of them are public nuisances, even on the highway. There are no divisions between the seats, and of course no doors. The light and ventilation of the buildings are very generally deficient.

The latrines generally require re-construction on the principles and plans recently introduced in this country. The best latrine for Gibraltar would be Macfarlane's or Jennings' latrine, Plans XII. and XIII., on account of the small quantity of water they require for use. Probably the material used by Mr. Jennings would be less acted on by sea water. Latrines should have proper divisions and half-doors, and all the buildings should be freely lighted and ventilated.

The urinals are badly formed and not properly drained, and there are no means of cleansing them. They should be formed of impervious material, in the manner shown on Plans XIII. and XIV.

Both latrines and urinals should be supplied with brackish or sea water in the manner already recommended, and some person in each barrack should be held responsible for their daily cleansing and general good order. As regards urinals, it will be sufficient to lay on water in such a manner as to admit of their being cleansed without the water constantly running over their surface. Night urinals should be provided wherever possible in lobbies near the barrack rooms, but cut off from them by cross ventilation. The latest improved form of night-urinal made by Mr. Jennings for the War Department, Plan XIV., is the best for this purpose.

### 12.—Married Quarters.

There is nothing in which Gibraltar is more deficient than in the amount and character of accommodation provided for married soldiers and their families. The details of all

buildings occupied by married people on 1st October 1861 are given in Appendix No. 14, which show that, in the proper sense of the term, there is very little such accommodation, and none deserving the name except what belongs to the Royal Artillery, which is managed by the officers. This latter class consists of separate cottages or rooms in groups, tolerably clean and convenient. There are 46 of these Artillery quarters, occupied by 46 men, 46 women, and 71 children.

The Royal Engineers have also 31 separate quarters and 12 huts, built by themselves, occupied by 43 men, 43 women, and 79 children. The huts accommodate two or three families each. There are some special quarters for non-commissioned officers, but, with these exceptions, married soldiers occupy any kind of building that can be had. Thus there are 21 barrack rooms taken away from the men and occupied by 91 men, 91 women, and 137 children. Other families are lodged in stores, officers' quarters, kitchens, school rooms, guard rooms, workshops, wooden huts; in short, the need is so great, that any kind of place is used, and many of them are most objectionable as regards health and decency. We have hardly ever seen human dwellings so bad as some of the wooden huts on the Neutral Ground and at Windmill Hill. They are ruinous, not water-tight, in such a condition that it is impossible to preserve either cleanliness or decency in them, and the poor women and children are worse off in this respect than the lowest class of the Spanish population about them. In these married quarters, made out of all kinds of buildings, there were 183 men, 183 women, and 238 children living, while we were at Gibraltar. There were in all classes of accommodation, 363 men, 363 women, and 525 children.

The only provision for the married people, allowed by regulation, consists of ten cottages belonging to the Artillery and Engineers, while the married quarters of one room each required for the present strength of the garrison amount to 464 rooms.

To provide this accommodation is a matter of urgent necessity. It would set free barrack room space at present misappropriated from its legitimate object, and would to that extent diminish overcrowding. Since our visit a block of married quarters has been ordered on Crutchett's ramp above the grand casemates. A very good site for a considerable number can be found near the new school, between Buena Vista and Windmill Hill. There are also other available sites at Rosia and other places, where convenient quarters can be built.

We would recommend most strongly that a sum of at least 5,000*l.* a year should be provided for this class of accommodation until a sufficient number for the wants of the garrison have been constructed. We have already laid down the principles on which this class of accommodation should be provided, and we have shown their application in Plan V.

### 13.—Instruction and Recreation.

There are four ball courts for the entire garrison, or about a tenth part of the number required; some very inferior regimental workshops for armourers, tailors, and shoemakers, but none for employing the troops; two small libraries without reading rooms, and two or three good school rooms nearly finished; but with these exceptions Government has done nothing to provide places of recreation for the men in this large garrison, who are said to suffer very much from want of occupation. This great want and the evil consequences which followed on it, led to the establishment, by private means, under the zealous direction of Captain Jackson, R.A., of the first organized soldiers' "home" or "institute," an institution now under the patronage of the Governor, and which all parties concur in stating has been of great benefit to the troops. A committee was formed and funds were raised. Fortunately one of the best houses in Gibraltar in a central part of the town was secured. It was liberally and comfortably furnished, well supplied with books, periodicals, newspapers, and games, including a number of excellent billiard and bagatelle tables. The walls are hung with excellent maps and prints, and have stuffed seats round them.

All the rooms are lighted with gas, and coffee, tea, and other similar refreshments, excluding all intoxicating drinks, are sold to the men at a small price. The subscription is 4*d.* per month, and at the time we were in Gibraltar 2,300 subscribers were on the books, a result quite sufficient to justify the undertaking and to hold out great hopes of success for similar institutions elsewhere. A short time since Government made a grant of 500*l.* to this "home," to relieve the funds from the charge of certain preliminary expenses, and it has been money well spent.

The long distance of the central building from the south end of the rock led to the opening of a branch at Rosia, and we found a wooden hut had been put up further south

still, as a second branch, which was also in full activity. It was in contemplation to provide a third branch at Europa, to extend the benefits of the institution all over the garrison.

After a careful inquiry into the merits of this institution, we have arrived at the conclusion that it is well worthy the countenance and support of Government.

It is, however, only advantageous to men when out of barracks, and although it is convenient, so far as distance is concerned, as a place of resort and rest for men of the north district while in the town, it would not be practicable to subdivide the institution into a sufficient number of branches to enable barrack reading and day rooms to be dispensed with. Under the peculiar local circumstances of Gibraltar both institutions are necessary. This felt necessity has led to the opening of a reading room at the South Barracks, under Colonel Fane's auspices, in a portion of the space properly belonging to the barrack accommodation. It was furnished, and supplied with paper, pens, and ink, to enable the men to write letters, and tea, coffee, and lemonade, &c., were sold at a small profit. The financial results of this arrangement were stated to be very favourable.

Every barrack should have its own reading and recreation rooms constructed in the manner described in Part I. of this report, and conducted on the principles laid down in the report of the Committee on Soldiers' Libraries and Reading-rooms, and Gibraltar is one of those garrisons where a garrison library could very well supply all the regimental libraries with books and games on the plan laid down in the Committee's report. But as already stated, this arrangement should in no way interfere with the "Home."

As far as regards means of out-door exercise, gymnasia, workshops, and generally means of providing rational occupation for men off duty, Gibraltar is as deficient as other garrison towns, and we would strongly advise that the advantages of these establishments should be afforded to the garrison as soon as means can be provided for the purpose.

### 14.—Hospital Accommodation.

There is no military hospital at this station, excepting temporary accommodation, set apart from time to time on the Neutral Ground or at Europa. The sick of the garrison are received into a large hospital at Rosia, belonging to the Royal Navy, an account of which we have given elsewhere. We have simply to state the fact, that for a garrison of upwards of 5,000 men there is no hospital; and that if, in the event of war, it should become necessary to receive sick and wounded men from the fleet as well as from the garrison, this could only be done in the existing building by overcrowding the wards to such an extent as would lead to very disastrous consequences.

The working of the present system shows that in time of peace no great practical difficulty arises from receiving sick from the fleet into the wards, except that the cubic space per bed is too small, and less than what is required by regulation. It would hardly be necessary to incur the cost of building an additional establishment for a rare emergency, which might be met by erecting temporary huts on Windmill Hill; but as the present hospital is defective in many important points of construction required for general hospital administration, it would be in the highest degree desirable to enter into some arrangement with the Admiralty, whereby the present building should be transferred to the War Office. If this were done there would be no difficulty in providing for any temporary extension the building might require to enable sick to be received from the fleet in any required numbers. The evil of the present arrangement is, that the building, as it is, does not fulfil the requirements of a military hospital, and that to make it do so, it would be necessary to incur expense in altering property belonging to another department which might find (in the event of its reclaiming the building, which it can do at any time) that the alterations were unsuitable to the habits and customs of the service.

We have endeavoured in the subsequent part of this report to lay down a plan for rearranging the allottment of rooms and wards, and for consolidating the administration, which will enable the most to be made of the existing building; at the smallest cost, and with the least possible disturbance in its structure. But it must be evident that at the best the arrangements must necessarily be of a temporary character, and on this account unsatisfactory in practice. The main question to be settled is to whom the hospital really should belong. The facts of the case would appear to indicate that the buildings should be transferred to the War Department, which has constant need of them and almost exclusively occupies them, under such reservations as to providing accommodation

for the sick and wounded of the fleet when necessary, as the interests of the public service require.

### 15.—Recapitulation.

The following are the chief points bearing on the health of the troops in Gibraltar, together with the improvements we have to recommend:—

1. The main causes of inefficiency and mortality in the garrison are miasmatic diseases, chiefly fevers of the continued and typhoid types, and consumption, together with syphilitic diseases.
2. That so far as regards local topography and climate, by themselves, there is nothing peculiarly unfavourable to health.
3. That there are very serious sanitary defects in the garrison, arising from the condition of the drainage and water supply, the local position and construction of casemates on the lower levels, and especially on the line wall, and in the construction of some other barracks, which are injurious to the health of troops.
4. There is want of proper ventilation and of means of warming and drying the air of casemates in the rainy season, from which and from the use of stone floors, especially in the low-lying localities, many of the barrack rooms are damp for a considerable part of the year.
5. There is much overcrowding in all the barracks, except in the newly-constructed huts.
6. The means of personal cleanliness are deficient.
7. The cooking arrangements are in an unsatisfactory state.
8. There are no suitable means of washing and drying linen.
9. The latrines and urinals are in a very noxious condition.
10. The paving in barrack yards and round barracks is not sufficient for surface drainage and cleansing.
11. The accommodation for married men, non-commissioned officers, and soldiers, is very deficient in amount, and some of it of a very unhealthy character.
12. That while we consider the "soldiers' home" of great benefit to the garrison, we are at the same time of opinion that suitable means of instruction, recreation, and employment connected with barracks are greatly required. These, together with proper gymnastic training, would improve the health of the garrison, and would tend to diminish the amount of disease resulting from intemperance and dissipation, the invariable accompaniments of want of occupation. In this way the outlay would be soon repaid.

Lastly, we would recommend, generally, the execution of the proposed measures of drainage and water supply with the least possible delay; that the present privies be reconstructed with Macfarlane's or Jennings' latrines, and supplied with brackish or sea water for cleansing; that the urinals have similar water laid on to enable them to be washed and kept clean; that as soon as an adequate supply is obtained, fresh water be laid on to all barracks for ablution, bathing, cooking, and washing; that the surface paving and channelling in barrack yards and about barracks be in future done with flags or asphalte; that all the casemates and barracks be ventilated in the manner pointed out, and all casemates provided with fireplaces; that provision be made with as little delay as possible for affording 600 cubic feet or more per man in barrack rooms, according to their construction and local position; that the barrack room floors be boarded over the flags, with ventilation beneath; that the ablution accommodation be extended and improved and baths provided; that improved boilers and ovens be placed in the cook-houses, and the ventilation of all the cook-houses requiring it be improved; that suitable places for washing and ironing linen be provided, with drying closets of the approved pattern for winter use; that the latrine buildings be reconstructed with divisions of seats and half-doors, and provided, with light and ventilation; urinals for barrack rooms and barrack yards of an improved construction, and of non-porous material, capable of being cleansed with water, should also be introduced; married quarters should be built, and additional provision made as regards libraries, reading rooms, game rooms, workshops, gymnasia, and means of exercise in connexion with the barracks.

## SECTION III.—SANITARY DETAILS REGARDING EACH BARRACK AND HOSPITAL.

Having stated, generally, the sanitary defects in these barracks, together with the remedies required, we next proceed to describe each barrack separately.

### 1.—Grand Casemates.

The Grand Casemates are situated immediately within the northern extremity of the works, close to the Landport and Waterport gates. They bound one side of a polygonal

area, the other sides of which are bounded by officers' quarters, guard room, gate, schools, and workshops. All the traffic from the Spanish lines and the water port passes across the ground, and the surface being macadamized there is much dust and glare from it. The site is very low and only a few feet above water mark. It is indeed nothing more than a narrow strip of sand and debris lying between the precipitous rock and the water. The rock cuts off ventilation on one side. The works are close to the back of the casemates on another side, and the front area, although of considerable dimensions, is shut in by the buildings already mentioned, and partly by the houses of the town. The cook-houses, wash-houses, canteen, and non-commissioned officers' quarters are in a narrow court behind the barracks, abutting against the fortifications, and together with walls which cross the space, they interfere injuriously with the external ventilation.

One result of the lowness of the site of these barracks, and their topographical relation to the rock, the sea, and the adjacent works, is that the subsoil on which they stand is always wet or damp. The damp passes through the stone pavement of the ground floors, and was quite perceptible when we were there at the end of the dry season.

The barracks are in two floors, and contain 26 rooms, 12 on the ground floor and 14 on the upper floor. They are all casemated, and not being built against the curtain, but separated from it by a narrow intervening space, they have windows and doors at each end. The ground-floor rooms are very nearly 100 feet in length, which is the distance between the opposite windows and doors. The beds are arranged with their heads to the piers of the arches. The upper rooms are 87 feet in length, and are shorter on account of a terrace being taken off from the lower rooms to give access by stairs at each end to the upper rooms. Both sets of rooms open directly on the outer air. The upper floors are boarded; those on the ground floor are flagged and are below the level of the ground outside. The casemates next the rock are dark, damp, and hardly fit for occupation. They are at present used for married quarters. The upper rooms are somewhat better, but they are all too long to admit of good ventilation, and show inattention to the requirements for health in their plan.

The upper rooms have arched brick roofs supporting the bombproof, through which the rain comes at certain points and drops on the men's beds.

Each room has a door and two windows at either end, with fan-lights over most of the doors, and they communicate by arched doorways in the division walls, whereby the ventilation is common throughout. Each room appears to have two empty fireplaces, with chimneys carried up in the division walls; grates have never been used in them.

The accommodation consists of 26 rooms, and is intended for 1,166 non-commissioned officers and men; the details are as follow:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows per Room. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| *Ground Floor.* | | Ft. In. | Ft. In. | Ft. In. | | | | | Ft. In. | Ft. In. |
| Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 - | 47 | 99 6 | 18 0 | 12 0 | $457\frac{13}{47}$ | $38\frac{5}{47}$ | 30 | 4 2 fan-lights. | 6 0 | 3 0 |
| *First Floor.* | | | | | | | | | | |
| Nos. 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26 - | 43 | 87 0 | 18 0 | 10 0 | $364\frac{8}{43}$ | $36\frac{8}{43}$ | 25 | 4 2 fan-lights. | 6 0 | 3 0 |
| Total - - | 1,166 | — | — | — | — | — | 710 | — | — | — |
| Guard rooms— | | | | | | | | | | |
| Artillery - | 5 | 29 0 | 16 0 | 11 0 | $1,020\frac{4}{5}$ | $92\frac{4}{5}$ | — | 1 | 5 6 | 2 8 |
| Line - - | 9 | 29 0 | 16 0 | 11 0 | $567\frac{1}{9}$ | $51\frac{5}{9}$ | — | 1 | 5 6 | 2 8 |
| Cells, 6 - - | 1 | 7 0 | 4 0 | 9 0 | 252 | 28 | — | None. | — | — |

*Overcrowding.*—A reference to this table will show that these barracks are greatly overcrowded. It appears that 564 men have each about two-thirds of the space required for health at home; while 602 men have each little more than one half the space they ought to have at home. The largest number of men which each of these ground floor casemates ought to hold is 30 instead of 47. In the upper floor the number should be reduced

from 43 to 25 men per room. This would give available accommodation for 710 men instead of 1,166, and the reduction would only allow a fraction more than 600 cubic feet per man. Except those at Hargreaves' barracks, the cells are the smallest we have ever seen. There is space in four of them put together for only one prisoner instead of four.

*Ventilation.*—The only means of ventilation are the doors and windows at each end, which are 99 feet 6 inches apart in the lower-floor rooms, and small chimney flues from the fire-places with openings 10 inches by 4, terminating on the level of the terreplein above. During heavy rains the rain beats into the openings and passes down the shafts into the rooms. It need scarcely be stated that the ventilation is very defective. The atmosphere in the rooms at night is offensive and bad. Zymotic diseases generally begin in the worst ventilated and most crowded rooms: on a recent occasion cholera broke out first on the ground floor. Overcrowding, bad ventilation, and damp are the causes why troops in this barrack are unhealthy and suffer from epidemic diseases.

To improve the ventilation it will be necessary to carry a shaft through the crown of each arch on the upper floor, as near the centre of the room as possible. One of Muir's construction, Fig. 19, will be found most suitable. It should have louvres at its lower end, to prevent down-draughts as far as possible, and to disperse any such over the room. Inlets for fresh air should be made close to the top of the arch, at each end over the door, and should be permanently louvred. The arrangement of shafts and inlets is shown in Plans X. and XI., Figs. 1 and 2.

The lower-floor rooms require shafts to be carried up the walls and through the roof of the casemates above. They should also have inlets for fresh air at the ends. Openings should at the same time be made into the chimney flues, not supplied with fire grates, as high up as possible. Care should be taken to keep the ventilating shafts quite distinct from each room to above the roof, to prevent foul air escaping from the lower into the upper room, either directly or indirectly. The doors between the rooms should all be closed. It is a cardinal point as regards ventilation, to keep the ventilation of each room distinct from that of every other. All the rooms are lighted with gas.

Ventilating fire grates should be introduced into all the lower-floor rooms, at least.

The floors should be boarded over, with ventilation beneath.

*Ablution and Bath Accommodation.*—There is none. The necessity for anything of the kind appears never to have been considered in the construction, and the men have to perform their ablutions in a gusty archway, passing through the lower floor of the barrack, which is also a public way into the town. A thin wooden partition separates the passengers imperfectly from the space where the men wash themselves. There is a wooden bench, but no water laid on; it has to be carried by hand. There is also a bench in the ditch behind the barrack, on which men can place their basins. It is close under the Landport drawbridge, which is one of the main entrances to the town, and the men have to perform their ablutions in sight of the passengers. There are no baths.

A proper ablution room, as in Plan XVII., with a few baths and water laid on, are absolutely indispensable for cleanliness, and should be provided forthwith. The present arrangement is highly discreditable, and has been frequently reported by the Governor.

*Cook-houses.*—These are behind the barracks, in a narrow court between them and the works. They are seven in number, and contain 29 boilers and 2 brick ovens. There are 3 belonging to the men and one belonging to the serjeants' mess. One or two of them require more ventilation, and the ovens are not good. Practically, these kitchens do not afford sufficient means for cooking, and require the new pattern steel boilers and ovens, Plan XVIII. There is no water laid on. It has all to be raised from a pump and carried by hand. There is no proper drainage of the kitchens. All waste water is thrown down a drain, in front of the doors, in the narrow court between the cook-house and the barracks.

*Women's Wash-house.*—There is one wash-house in the same line as the cook-houses. It has nothing in it for washing except boilers. There is no roof ventilation.

*Drainage.*—The drainage of the barracks is very defective on account of the very small fall. This will be always a difficulty with these barracks, but many of the practical evils will be remedied under the proposed new drainage works for the garrison.

*Water Supply.*—This is derived from a tank and well. It is not laid on for any purpose, and requires entire re-arrangement when proper ablution rooms, latrines, &c., are constructed.

*Privies and Urinals.*—The privies are simply seats without divisions placed over an open trough or drain, washed out daily by allowing water from a cistern to flow through it. The trough is never properly cleaned out, and the whole arrangement is offensive and

requires reconstruction with Macfarlane's or Jennings' latrine, Plans XII. and XIII. The latrine should be raised above the level of the ground, to give the requisite fall for drainage. The buildings require additional roof ventilation.

There is a privy belonging to the market at the Waterport, close to the barracks, which discharges its contents into the sea, and is a great nuisance because the water is kept in a stagnant condition by the old mole at this point. It should be reconstructed as a water latrine, and discharged not directly into the sea but into the general system of drainage for that end of the town, the outlet for which is south of the old mole. Macfarlane's iron latrine, sufficiently raised above the ground to obtain the required fall, would answer the purpose. All these latrines should have a constant supply of sea or brackish water attached to them.

*Cleansing.*—There is an ashpit close to the privies; an iron box should be substituted for it, and the contents emptied into a cart and removed daily. Ashpits in so confined a locality and in such a climate, are quite inadmissible.

*Married Quarters.*—The non-commissioned officers' quarters are in the same narrow court-yard where the cook-house is. They are partly under a lean-to, partly in arched recesses under the terreplein. They are very deficient in accommodation; damp, particularly the inner half, under the battery; they have no through draught; they have stone floors, and, taken as a whole, are unfit for occupation.

There are no married soldiers' quarters. Three of the worst of the men's rooms on the ground floor are misappropriated for the purpose, and occupied by different families without proper divisions.

*Canteen.*—None. Only a small shed behind the casemates.

*Schools, Workshops, &c.*—These are situated in a one-story building, bounding one side of the parade ground. There are two schools, good, light, and well ventilated; one, not required, was about to be turned into a reading and day room. The shops are by no means so good as the school rooms. There is one for tailors and shoemakers, which is too small, and part of the adjacent store has to be used for the shoemakers, to the diminution of the store accommodation. There is another small dark tailor's shop near the non-commissioned officers' quarters. The armourer's shop in the same range is very bad.

*Guard Rooms.*—There are two guard rooms. That for the line regiment is very small and crowded, and has no lock-up room. It requires a ventilating shaft in the roof, and a remodelled fire-grate.

The Artillery guard room is about the same size, but has a smaller number of men in it and is less crowded. There are six cells, very small, with stone floors; they have no ceilings. They are ventilated as well as their small cubic contents will allow.

*The Main Guard* at the Waterport has a room for the men and one for the serjeant. The urinal has been placed close to the guard room door, and should be removed to a greater distance.

It will be seen that the great sanitary defects in these barracks, besides their local position, stone floors, and bad construction, are overcrowding, want of ventilation, want of means of personal cleanliness, no proper water supply, defective cook-houses and cooking arrangements, insufficient means of washing linen, badly-constructed privies and urinals, want of married quarters and proper workshops, and want of ventilation and other arrangements in guard houses.

We would recommend all the defects, admitting of remedy, to be dealt with on the general principles already laid down.

Montague Cavalier Guard is a small guard room overlooking the old mole. It has no privy nor place for ablution. It has a urinal and also a fireplace, but has no ventilation. It requires a shaft in the roof for removing foul air, and an inlet for fresh air in the walls near the ceiling.

## 2.—Orange Bastion.

This work is part of the sea front of the fortifications, and contains 4 bomb-proof rooms built side by side. The situation is very low, being only a few feet above the water level. The rooms are entered from a small triangular court yard, about 6,572 square feet in extent, sunk below the surrounding levels and buildings. The surface of this court was badly paved and drained at the time we saw it, and the stones were damp even in dry weather. The external ventilation is most deficient, and is only compensated for in any degree by the sea breeze sweeping over the top of the works. The barrack rooms are no less than 104 feet long and only 14 feet wide. When we visited them at night the beds were so close together that it was difficult to move

along between them. Each casemate has a door and two windows, one on each side the door, with an opening over the door, and two loopholes at the far end. The result is that the rooms are dark, damp, gloomy, and uncomfortable. The floors are of stone, and are damp from the wet subsoil below. The whole barrack is a very bad specimen of casemate construction, and admits of very little improvement. It is built of limestone, and the arches are so insufficiently protected that water comes through in rainy weather and adds to the dampness of the rooms.

The following table gives the accommodation:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows per Room. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| Nos. 1, 2, 3, 4 | 40 | Ft. In. 104 8 | Ft. 14 | Ft. In. 11 6 | $418\frac{6}{10}$ | Ft. In. 33 11 | 20 | 2 | Ft. In. 5 6 | Ft. In. 2 6 |
| Total - | 160 | — | — | — | — | — | 80 | — | — | — |
| Guard Room, 1 Non-Commissioned Officer and 3 Men - | 4 | 9 11 | 11 10 | 9 10 | — | — | — | 1 | 2 5 | 1 11 |

*Overcrowding.*—The regulation space of 418 cubic feet per bed shows great overcrowding. If the barrack were otherwise good and situated in a cold climate, the present regulation would place in it a third more men per room than would be considered safe for health. We are of opinion that, taking into account the local position and bad construction of the casemates, no more than 20 men per room should be permitted to inhabit them.

*Ventilation.*—The only means of ventilation for these long rooms consists of three openings in the arch leading into a horizontal shaft, terminating in a chimney 5 or 6 feet in height. The arrangement is of little use, for we found the air most offensive in visiting the rooms at night. We would propose to improve the ventilation by enlarging the openings and shafts to three times, at least, their present sectional area, and by raising the vertical portion at least 12 feet in height, and protecting them against rain. Louvred openings 18 inches square should also be made in the walls at both ends close under the soffit of the arch, to admit more fresh air. Valves should be provided, to enable the area of the shafts to be diminished to their present size in cold weather. Ventilating fire grates are also absolutely necessary to keep the arches moderately dry in the rainy season. The floors should be boarded over, with ventilation beneath.

The rooms are lighted with gas.

*Ablution and Bath Accommodation.*—There is an ablution shed with louvred end and side for ventilation. It has benches of stone and wood to hold the basins and buckets in which the men wash. The floor is of asphalte, with a drain opening in the middle. There is no water laid on. There is no bath. One bath with a water-supply is required. Water should also be laid on to the ablution benches. This ablution room is used by the women for washing linen, as there is no accommodation for the purpose.

*Cook-house.*—The cook-house is large and airy. It contains 5 boilers of the ordinary pattern, and a brick oven. Steel boilers and an oven of the improved construction, Plan XVIII., should be substituted for the present apparatus.

*Water Supply and Drainage.*—There is a well in the court yard yielding brackish water unfit for use. The only other water is supplied by the commissariat. The quantity carried in barrels for cooking, ablution, &c. for 90 men, is 20 barrels a day.

As already stated, the surface drainage and paving are not good. A large town sewer passes under the court yard of the barrack through the works into the sea. It is discharged by an iron pipe, but not into a sufficient depth of water, consequently there is much nuisance experienced at times from foul decomposing sea water immediately outside the works.

*Privies and Urinals.*—The latrine is of the same bad construction as that in the Grand Casemates already described; it consists of a deep trough without water, except what is passed through it once in 24 hours, and is most offensive. The urinals are also of defective structure, and have no water. There is drainage into the large sewer already mentioned.

The whole requires reconstruction, as a water latrine on Macfarlane's or Jennings' principle, with divisions of seats and half-doors.

*Cleansing.*—There is no ashpit. The only proper method of cleansing for such barracks as this is the one adopted. All refuse is thrown into an iron box and removed daily.

*Guard Room.*—The guard room has a window at the back, admitting of ventilation. It is occupied by one non-commissioned officer and three men. It has a stone floor. The lock-up is badly paved, and the floor is damp. The ventilation is not sufficient. There is gas in the guard room.

*Married Quarters.*—There are no married soldiers except the serjeant, who has a room, with a fire-place and old pattern grate.

The sanitary defects in this barrack are, bad position, over-crowding, bad ventilation, darkness, damp, want of water, bad latrines and urinals, and defective drainage. The first of these admits of no alleviation. All the others can be more or less removed.

### 3.—Prince Albert's Front.

This is a recent work, situated in the line of wall to the south of Orange Bastion. It consists of a number of casemates built into the wall with their axes at right angles to its direction. Five of these were occupied by troops at the time we inspected them, and some others, intended for stores, were in use as married quarters.

The position is very low and confined, on the sea shore little raised above the water level, and the ground on which the town stands, exclusive of the height of the houses, is higher than the casemates.

There is a narrow yard of about 24,750 superficial feet in front of the men's quarters. Opposite the casemates used by soldiers' families, there is a high wall, which obstructs light and makes the rooms almost dark.

Each room has a door with a fanlight over it, and a window on each side the door. Two of the rooms have loopholes, but they cannot be kept open on account of the disagreeable smell proceeding from the mixture of sewage and stagnant salt water outside. The rooms are connected by arches in the division walls, and have their ventilation in common.

All that part of the barrack which is under the battery is very damp during winter and wet weather.

One of the town sewers passes under the court yard in front, and also under the works to the sea; and whenever the heavy rains begin to fall, the sewer is burst close to the barracks; the court yard becomes more or less flooded; a most abominable nuisance arises, until the accumulated obstructions can be cleared out and the water way restored.

This great evil will be remedied by the proposed diversion of the higher sewage from the low lying districts.

All the floors are of stone instead of wood, and are liable to damp

There is no gas, the rooms are lighted with oil lamps.

The following table gives the accommodation in this barrack:—

| Rooms.* | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| Nos. | | Ft. In. | Ft. In. | Ft. In. | | | | | Ft. In. | Ft. In. |
| 3 | 12 | 51 10 | 17 8 | 11 6 | $877\frac{1}{2}$ | $76\frac{3}{12}$ | 12 | 2 | 5 8 | 3 6 |
| 4 | 29 | 55 0 | 18 0 | 11 6 | $392\frac{17}{29}$ | $35\frac{5}{29}$ | 18 | 2 | ,, ,, | ,, ,, |
| 5 | 32 | 58 8 | 17 10 | 11 6 | $375\frac{15}{16}$ | $32\frac{1}{12}$ | 19 | 2 | ,, ,, | ,, ,, |
| 6 | 29 | 55 4 | 17 10 | 11 6 | $391\frac{8}{29}$ | 34 | 18 | 2 | ,, ,, | ,, ,, |
| 7 | 12 | 51 10 | 18 0 | 11 6 | $894\frac{1}{12}$ | $46\frac{13}{20}$ | 12 | 2 | ,, ,, | ,, ,, |
| Total - | 114 | — | — | — | — | — | 79 | — | — | — |
| Guard Room | 4 | 18 0 | 18 0 | 11 6 | — | — | — | 2 | 5 8 | 3 6 |
| Lock-up - | — | 18 0 | 7 0 | 11 6 | — | — | — | — | — | — |

*Overcrowding.*—The table shows that rooms 4, 5, and 6 are very much overcrowded. They ought to have respectively no more than 18, 19, and 18 men at the very most, allotted to them.

* No. 1 is used as a Guard Room, No. 2 as Married quarters.

*Ventilation.*—Each room has a shaft, 1 foot 10 inches diameter, carried up from the top of the end wall, opposite the door, into the parapet above, on the inner side of which it opens. There are no inlets for fresh air. The shafts require to be enlarged to the proportionate areas laid down in the previous part of this report; and louvred openings, of the same proportionate areas, should be made close to the arches above the doors to act as inlets. There are no chimneys or fireplaces. It is essential to health that these casemates should be provided with ventilating firegrates. The floors should be boarded and raised to allow ventilation beneath.

*Ablution and Bath Accommodation.*—The ablution room is a shed building adjoining the wash-house. It has a stone bench, and the men wash in the usual basins. There is no bath, no water supply, and the means of cleanliness are deficient. The ablution arrangements should be remodelled, as in Plans XV., XVI., and XVII., and one bath at least provided.

*Cook-house.*—This is situated in one of the casemates. It has four boilers and a brick oven, which does not appear to answer, as the cooking is said not to be sufficiently varied. The room is ventilated by a shaft, and there are three loopholes at the end. The new steel boilers and steel oven, Plan XVIII., should be supplied.

*Water Supply and Drainage.*—There is a pump in the court yard, which supplies brackish water unfit for use; all the other water has to be carried by the commissariat. The barracks are drained into the sewer, which bursts periodically. The surface drains are trapped.

*Women's Wash-house.*—None. There are no means either for washing or drying linen except in the barrack yard.

*Latrines and Urinals.*—There is a latrine of the usual form, washed out daily from a cistern which has no water except what is put into it by a fatigue party. The whole arrangement is extremely imperfect and offensive. The urinal is in the same place as the latrine, and is also offensive from want of water for cleansing. The place where the latrine is situated is dark and badly ventilated. There are no divisions between the seats. The whole requires reconstruction. A Macfarlane's or Jennings' latrine, raised a foot above the floor, would afford the fall and means of flushing requisite to sweep the contents into the sea.

In this barrack also there are no ashpits, and the refuse is carried away daily as it ought to be.

*Married Quarters.*—These are in store rooms, misappropriated for the purpose, and scarcely fit for human habitation.

*Guard Room.*—There is a tolerably good guard room and lock-up, both have ventilation. The guard room has a fireplace.

The sanitary defects in Prince Albert's Front barrack are, low, damp, dark locality, overcrowding, defective ventilation, stone floors instead of wooden floors, want of fireplaces, no water supply, bad drainage, imperfect latrines and urinals, want of sufficient means of cleanliness, defective cooking arrangements. These defects should be removed in accordance with the principles we have already laid down.

### 4.—King's Bastion.

This work is situated at the southern end of Prince Albert's Front. It projects out from the main line of defences towards the sea, and the casemates face towards the inclosed area of the bastion, with their ends outwards. The barrack square has 16,836 superficial feet of surface. The position is very little above the water level, so little that water occasionally rises through the stone floors of the barrack rooms. Recently a range of loopholed buildings, containing officers' quarters, has been built across the gorge of the bastion, a measure which has converted the whole work into a deep sunk damp court, with little external ventilation.

The barrack rooms are low, narrow, long, dark, and damp casemates, resembling an inferior kind of cellars. Each has a door with a small window on either side, and a fanlight above. Some of them are not water-tight, and it is stated that rain sometimes comes through the arches like a drip-stone. Each casemate has a fireplace at the far end, used during the winter.

The rooms are so narrow (only 14 feet wide) that when the beds are made down they all but touch each other.

The court yard is paved with rough cobble stones, in a bad condition as regards surface drainage, and there is a large offensive gulley grate in the middle of it.

One of the town sewers passes through the works close to the north end of the barracks. It had become obstructed, and was being opened and cleansed at the time we were there, to the endangering the health of the barrack.

Taken as a whole, this is one of the worst casemated barracks we have ever inspected; and apart from any considerations of health, very little of it is fit for human habitation.

The officers' quarters in the retrenchment are on two floors, the lower floor being below the level of the road which passes close to it. They have loopholes towards the barrack court yard, and doors and windows towards the town side. The stairs between the floors are very dark, and consequently very dirty. The verandah giving access to the rooms is too narrow.

The following table gives the men's accommodation in the casemates:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area per Man. | Number of Men each Room should contain. | Windows per Room. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| No. 16 | 16 | Ft. In. 45 0 | Ft. In. 14 0 | Ft. In. 11 0 | 433⅛ | 39⅜ | 8 | 2 | Ft. In. 3 0 | Ft. In. 1 6 |
| Total - - | 256 | — | — | — | — | — | 128 | — | — | — |
| Guard Room | — | 16 0 | 15 0 | 10 6 | — | — | — | 2 | 4 9 | 2 9 |
| Cells 2 - | — | 9 9 | 7 3 | 10 6 | — | — | — | — | — | — |

*Overcrowding.*—Each of these bad rooms has about double the number of men it ought to have in it. By allotting eight men per room the cubic space per men would be 866 feet, certainly the smallest amount consistent with anything like health in such a place.

In a recent report on this barrack made by Major-General Sir Robert Walpole, he says, "The closeness and stench of those rooms at night are terrible." This is due to their low position, bad construction, want of means of renewing the air, and excessive overcrowding.

*Ventilation.*—There are no means of ventilation except the doors and small windows, and the fireplace when there is a fire.

The rooms are dark by day, and there is no gas at night. Oil lamps are used for lighting. There are fixed shelves along the walls and hanging shelves of wood are carried across the room, interfering with any movement of the air within.

Remodelled fire grates should be introduced, and a ventilating shaft carried up from the crown of the arch, Plan XI., Fig. 3. There should be permanent louvres in the wall close to the arch above the doorway. Ventilated gas burners, so arranged as to assist the ventilation of the rooms, should be provided.

The floor flags should be boarded over, with free ventilation beneath.

*Ablution and Bath Accommodation.*—None. Men wash in the yard.

*Cook-houses.*—There are two cook-houses situated in casemates. They have each 4 boilers and a brick oven, which appears to be little used. The ventilation is deficient in both cook-houses.

*Women's Wash-house.*—A number of married people live in the barrack, for whom there is no washing accommodation. They have to wash and dry linen in the barrack yard in all weathers.

*Water Supply.*—The only source of water in the barrack is a brackish well in the yard. Water has to be carted by the commissariat, or carried by fatigue parties.

*Latrines, Urinals, and Drainage.*—The latrines and urinals are in a casemate, between which and the cook-house there is a barrack room. The latrine is merely a trough washed out very imperfectly through a drain into the sea. The surface drainage of the barrack appears to be connected with the same drain. The urinal is in the latrine, and water poured into it passes through the latrine. The casemate where they are situated is not sufficiently ventilated, and the place is extremely offensive.

At one end of the retrenchment built across the gorge of the bastion there is another set of latrines of a better construction. The trough is not so deep and water stands in it.

Both latrines should have Macfarlane's or Jennings' apparatus substituted for the present defective arrangements. It should be raised above the level sufficiently to afford a good fall for the sewage.

*Cleansing.*—There is no ashpit. All refuse is collected in iron boxes and removed daily. This is the only good point in the establishment.

*Married Quarters.*—The accommodation provided for married soldiers is of a most miserable description. It consists of a certain number of the worst casemates, misappropriated from the barrack accommodation. The casemates are unfit for either purpose, but being so abstracted, the men have been more overcrowded in the other casemates in consequence. Families are not separated from each other, except by curtains, at night.

There is no place for cooking, and the women have to prepare their meals on small earthenware fireplaces in the open court yard.

*Guard Room and Cells.*—These are situated in the retrenchment. The guard room has windows on one side, and the cells have loopholes. There are no other means of ventilation.

The sanitary defects in this barrack are, low damp position, bad drainage, bad construction, overcrowding, want of ventilation, no gas, want of good water, want of ablution and bath accommodation, and also of means of washing and drying linen; bad latrines and urinals; no suitable married quarters. The place is altogether so unsuited for a barrack that were it possible to leave it unoccupied at ordinary times, it would be better to do so. Otherwise, the defects pointed out should be remedied with as little delay as possible.

## 5.—Wellington Front.

This is a recently-constructed work, and consists of two salients and a curtain, at a short distance south of King's Bastion.

The position is on the sea-shore, low and damp, especially in rainy weather. The site has all the defects of the others we have described, but the casemates are of better construction; at least they are larger, loftier, and make better rooms. The rooms in the curtain are arched bomb-proofs, with one end towards the barrack yard and the other towards the wall. The barrack yard has an area of 24,156 square feet. The rooms in the angles are sub-structures, supporting the terreplein on a number of piers and arches, covering a considerable area, and converted into barrack rooms by carrying partial walls across the spaces between the piers, leaving the arches open above. It results from this form of construction that certain only of the rooms have direct access from the open air, and several inner rooms have to be reached by passing through the outer rooms. These inner rooms have no light or ventilation, except such as they receive by the doors in the party walls or through the vacant spaces left under the arches. Some of them have shafts carried up in the back wall to the parapet; others have none, and the means of ventilation are quite insufficient. The casemates in the curtain have shafts carried up in the back walls. At the end of the dry season, when we inspected these barracks, there was appearance of damp in them; they have no fireplaces, and during the rainy season they are said to be extremely damp.

The door and window space varies in different sets of rooms. Those in the curtain have a window on each side of the door, with a fixed fanlight over it, and a circular opening over the fanlight which can be closed by a shutter. A number of rooms have neither doors nor windows to the outer air on account of the construction.

The following table gives the accommodation:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| Nos. 1 to 7, 10 to 19, 22, 23, 26 (20 rooms) | 19 | Ft. in. 34 0 | Ft. 18 | Ft. 15 | $483\frac{3}{19}$ | $32\frac{4}{19}$ | 14 | 2 | Ft. in. 5 4 | Ft. in. 3 0 |
| No. 8 - - | 18 | 32 6 | 18 | 15 | $487\frac{1}{2}$ | 38 | 13 | 2 | 5 4 | 3 0 |
| „ 9 - - | 20 | 38 0 | 18 | 15 | 513 | $34\frac{1}{2}$ | 15 | 2 | 5 4 | 3 0 |
| „ 20 - - | 18 | 38 0 | 18 | 15 | 570 | 38 | 15 | 2 | 5 4 | 3 0 |
| „ 21 - - | 18 | 32 0 | 18 | 15 | 480 | 32 | 13 | 2 | 5 4 | 3 0 |
| „ 24 - - | 18 | 34 0 | 18 | 15 | 510 | 34 | 14 | 2 | 5 4 | 3 0 |
| „ 25 - - | 17 | 38 0 | 18 | 15 | $603\frac{9}{17}$ | $40\frac{4}{17}$ | 15 | 2 | 5 4 | 3 0 |
| „ 27 - - | 20 | 34 0 | 18 | 15 | 459 | $30\frac{1}{6}$ | 14 | 2 | 5 4 | 3 0 |
| „ 28 - - | 24 | 34 0 | 18 | 15 | $382\frac{1}{2}$ | 26 | 14 | 2 | 5 4 | 3 0 |
| Total - | 533 | — | — | — | — | — | 393 | — | — | — |
| Guard-room - | — | 31 0 | 18 | 15 | — | — | — | — | 5 4 | 3 0 |
| Four cells - | — | 14 10 | 8 | 15 | — | — | — | — | 5 4 | 3 0 |

*Overcrowding.*—It will be seen from this table that all the rooms are more or less overcrowded. To afford even moderate cubic space it would be necessary to remove five men out of each of the 20 19-men rooms, and as many out of the others as would give about 650 cubic feet to the remainder. This will reduce the accommodation from 533 to 393 men.

*Ventilation.*—The means of ventilation are those already described. They are insufficient, and can hardly be said to exist in the inner rooms, some of which have loopholes only. All the rooms require shafts of sufficient area introduced as in Plan XI., Fig. 3. The circular openings over the doors should have permanent louvres placed in them. All the fanlights should be made to open inwards, and improved fireplaces should be constructed in each room.

The flags should be boarded over, with ventilation beneath.

*Ablution and Bath Accommodation.*—This consists of a shed building with partially louvred sides for ventilation, some way off from a number of the men's rooms; fitted up with stone benches for basins, but not supplied with water. There are no baths, and the means of cleanliness are insufficient.

*Cook-house.*—The cook-house is a casemate containing 12 boilers and a brick oven. It has a ventilating shaft, but the means of ventilation are quite insufficient to keep it cool. It is too small for the amount of cooking in such a climate. It would improve this cook-house to provide it with steel boilers and oven.

*Women's Wash-house.*—This is in a casemate, and is fitted up with boilers and washing benches. Linen is dried in the barrack square.

*Water Supply.*—Derived partly from a brackish well in the barrack yard. For most purposes it has to be carried in buckets from tanks some distance off.

*Latrines, Urinals, and Drainage.*—The latrines are in a casemate tolerably ventilated. They consist of a deep trough flushed out with water, but water does not stand in it. The urinals are in the same place; both are drained direct to the sea. The construction is not good, and the arrangements are offensive. Like the other barracks, these require properly constructed water latrines with water laid on. A Macfarlane's or Jennings' latrine, raised above the level of the ground to afford sufficient fall to the sea, should be introduced.

The drainage of the barrack yard is not good on account of the surface being gravelled instead of flagged, and from the same circumstance it was not so clean as it might have been.

There is a town sewer passing under the barracks to the sea, which burst and flooded the yard some two years ago. This will be prevented in future when the proposed drainage works are completed.

*Cleansing.*—In this barrack also the refuse is collected in iron boxes and removed daily.

*Married Soldiers' Quarters.*—None, except barrack rooms, a number of which were misappropriated for married quarters at the time of our inspection; and the men were consequently subject to the evils of greater overcrowding. Non-commissioned officers have quarters provided by dividing casemates longitudinally, to convert a casemate into two quarters; the rooms are very dark.

Guard Room and Cells.—These are in casemates also; the guard room has a grate. The cells are simply four divisions of the casemate, the two back ones of which receive no direct light or air.

The casemates of Wellington Front, although somewhat better in construction than others, nevertheless afford a very inferior description of barrack accommodation. As regards sanitary defects the site is low and damp; the rooms are overcrowded, and many of them misappropriated for other purposes; they have no fireplaces, and the ventilation is very defective; there is no proper water supply; the means of cleanliness are not sufficient; the latrines are of bad construction.

There are no proper married quarters; the non-commissioned officers' rooms are not sufficiently good.

### 6.—Moorish Castle Barrack.

This barrack consists of a single oblong block of building under the walls of the old Moorish Castle, about 200 feet above the sea level. It is erected on a platform partly cut out of the solid rock. The exposure towards the bay of Gibraltar is free and open, but not so towards the rock, the scarped surface of which rises vertically at a few feet from the back of the building. The accommodation consists of four rooms on two floors, the upper rooms being reached by an open wooden verandah. The rooms have windows on opposite sides, admitting of free ventilation when properly made use of. The neighbouring ground is very irregular and broken up into a number of small areas which have been increased by cutting away the rock on the slopes to afford space for various structures connected with the barrack, such as cottages used as married quarters, &c. The ground adjacent to the barrack has an area of 10,544 square feet. An additional area could easily be obtained for extending the accommodation required at this point of the rock.

The following table shows what the amount of this is at present:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | | Ft. in. | Ft. in. |
| 1 - | 20 | 36 0 | 20 2 | 11 3 | 408⅓ | 36½ | 15 | 9 | 5 0 | 3 6 |
| 2 - | 20 | 36 0 | 20 2 | 11 3 | 408⅓ | 36½ | 15 | 9 | 5 0 | 3 6 |
| 3 - | 20 | 36 0 | 20 2 | 10 0 | 363 | 36½ | 12 | 9 | 5 0 | 3 6 |
| 4 - | 20 | 36 0 | 20 0 | 10 0 | 360 | 36½ | 12 | 9 | 5 0 | 3 6 |
| Total - | 80 | — | — | — | — | — | 54 | — | — | — |
| Guard-room | — | 14 0 | 12 6 | 10 0 | — | — | — | 2 | 3 9<br>2 2 | 3 2<br>1 0 |

*Overcrowding.*—The barrack is considerably crowded, and even at the small allowance of space per man at present given, it does not contain the force of Royal Artillery considered necessary at this point, and 32 men have to be accommodated in tents at all times, summer and winter.

The rooms, though very much better than any of the casemates, are still of an old inferior character. The lower floors are paved, and there are no fireplaces. But the position is high and airy, with ample means of natural drainage, and by judicious planning additional accommodation might be advantageously provided on this site. In such a barrack 600 cubic feet per man ought to be enough for health. Rooms 1 and 2 should have 15 men each instead of 20; and rooms 3 and 4 should have 12 each instead of 20 each. The lower floors should be boarded, and have ventilation beneath.

*Ventilation.*—The existing means of ventilation, both on account of the position of the barrack and its construction, are much superior to those of the casemates, but they are nevertheless deficient. The windows are much lower than the ceilings of the rooms, and leave a large unventilated space above. This defect is partly remedied by air bricks covered with wire gauze placed at the ceilings, but there are no proper outlets. This should be remedied by introducing shafts at the corners of the lower rooms, and in the middle of the roof of the upper rooms, as in Plan X., Fig. 2. There is no gas introduced: the rooms are lighted with oil lamps.

*Ablution and Bath Accommodation.*—There is an ablution shed with a stone bench for placing basins on, which at the time of our inspection was used as a store, and there was virtually no place to wash in. Water is not laid on, and there is no bath; the means of personal cleanliness are thus very deficient. These defects should be remedied by introducing fixed basins, as in Plan XV., and a bath should be provided.

*Cook-house.*—There is a detached cook-house containing four boilers and a brick oven. It has windows on three sides and roof ventilation. The means of cooking are said not to be sufficient, and there is no water laid on. The new steel boilers and oven, Plan XVIII., should be introduced.

*Women's Wash-house.*—None.

*Water Supply.*—All water has to be carried up to the barrack; the quantity allowed is 2½ gallons per man per day, except on Saturday, when 200 additional gallons are provided for the barrack. Water should be laid on as soon as the works at this end of the rock are completed.

*Drainage.*—The surface drainage is by no means good; the paving, such as it is, is very rough, and foul water was lying about at the time we were there. Indeed the entire drainage of this part of the rock requires reconstruction, and to be connected with the town drains. The drainage from the Castle prison comes through the hill side and creates nuisance close to the barrack and married quarters.

*Latrines and Urinals.*—One of the latrines is said to be drained. Others are over cesspits, of which one is emptied by lifting a trap door in front of the seats. This latrine is built against the slope of the hill at a short distance from the barrack, and the soil percolates through the wall. The whole of the latrines are in a most offensive condition, and require entire reconstruction on Macfarlane's or Jennings' plan, with water laid on and drainage.

There are two urinals; one close to the kitchen, and the other in an open exposed situation; neither have water for cleansing. They should be reconstructed on Plans XIII. or XIV. in a proper position.

*Married Quarters.*—These consist of a number of small one-story cottages, belonging to a committee of the Royal Artillery, who collect rents and perform repairs and improvements when the fund admits of it. Some of these cottages have paved floors, some have wooden floors. The general condition of some of the quarters is good, but others

are bad. The rents vary from 4*s.* 3*d.* to 2*s.* 6*d.* per month. Their only source of water supply is from rain collected in tanks, but the amount is insufficient for summer use.

The staff serjeants' quarters are many of them very good.

The latrines belonging to the married quarters are over cesspits, which cost from 12*l.* to 15*l.* a year to empty. There is a sewer close at hand into which they could be drained. The drainage and water supply of these quarters should be considered along with those of the barracks.

Ashpits are emptied chiefly by the town scavenging department. Iron boxes should be used instead.

The tailors' shop has no ventilation.

There is a general complaint of want of workshops and other means of recreation.

There is only a ball court.

*Guard Room and Cells.*—The guard room is rather small. It has windows on two sides, but no other means of ventilation. The cells are on the opposite side of the road. They are small; have paved floors, and they are not sufficiently ventilated.

*Royal Artillery School.*—This building is on a lower level than the Moorish Castle barrack, and is situated at some distance from it to the south. It has windows on opposite sides and ventilation in the roof, but not sufficient; inlets at the eaves are required besides. The floor is flagged instead of being boarded. The regulation desks and forms are not supplied, and the accommodation is too small.

The girls' school has to be held in a hospital marquee pitched outside. The best thing to do in this case is to build a sufficient school on the site, a proposal which has been already made.

It will be seen that these barracks are defective in several important requirements for health. The chief of these is want of water and drainage, cesspits, bad latrines, no suitable means of personal cleanliness, defects in paving, and surface drainage; want of workshops, insufficient ventilation generally; overcrowding, and want of barrack accommodation commensurate with the requirements on the spot. The sanitary defects should be removed, and the barrack extended on the principles we have laid down, to afford the required accommodation.

### 7.—Gunners Barrack.

This building is situated near the garrison library in a central part of Gibraltar. It is chiefly occupied by detached men of the Royal Artillery. The orderly room of the Royal Artillery and other offices, a library and reading room, dispensary, and examination room are in the same buildings. The situation is a confined one, and there is a small court yard having an area of 2,995 superficial feet, surrounded by buildings, out of which the various offices and rooms are entered.

On the ground floor are the medical offices and a store; dark, damp, and without sufficient ventilation. On the first floor is the library and reading room, and the upper floor is divided longitudinally by a partition with openings through it. One of the divisions is used as a tailors' shop, and the other as a barrack room for 10 or 12 men. The following are the dimensions of the principal rooms:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| Nos. | | Ft. In. | Ft. In. | Ft. | | Ft. In. | | | Ft. In. | Ft. In. |
| 1, 2, 3 each* | — | 41 8 | 12 0 | 12 | — | — | — | — | — | — |
| 4 | 12 | 41 8 | 12 0 | 11 | 500 | 41 8 | 10 | 4 | 3 4 | 3 0 |
| 5 | 12 | 41 8 | 12 0 | 11 | 500 | 41 8 | 10 | 4 | 3 4 | 3 0 |
| Total - | 24 | — | — | — | — | — | 20 | — | — | — |
| Guard Room - | — | 13 0 | 12 6 | 11 | — | — | — | 2 | 3 9<br>2 1 | 3 3<br>3 0 |

* Used as Dispensary, Library, Reading Room.

*Overcrowding.*—These rooms should not contain above 10 men each at the outside. With so small a number of men in the barrack, 600 cubic feet per man should be sufficient, with free ventilation.

*Ventilation.*—The ventilation of the barrack room is common to that of the crowded tailors' shop, and as there are no sufficient ventilating arrangements the places are always more or less unwholesome. The openings between the rooms should be closed, and each room ventilated separately by shafts carried up through the ridge, and by inlets at the eaves. There is no fireplace in the barrack room.

The library and reading room, though lighted with gas, have no ventilation. They require shafts carried above the roof and inlets at the ceilings. These rooms are very low in the ceilings.

*Lavatory and Bath Accommodation.*—There is none at present. A shed under the guard-room is intended for an ablution room. It has slate troughs, and is now used as a woman's wash-house.

*Cook-house.*—The cook-house is in the yard, and is supplied with three small boilers and a brick oven. Cooking said not to be sufficiently varied. The new steel boilers and steel oven should be substituted for the present apparatus.

*Water Supply.*—No water laid on. There is a water tank.

*Latrines, Urinals, and Drainage.*—One of the town sewers appears to pass under part of the barrack. The surface drainage is bad on account of defective paving. The latrines are merely flushed troughs; the place where they are is dark and dirty. The drainage requires to be improved in connexion with the general system of town drainage. The latrines should be reconstructed on Macfarlane's or Jennings' principle. The barrack refuse is removed daily.

*Guard Room.*—The guard room has perforated zinc ventilators. It is provided with a wooden floor.

*Married Quarters.*—The only married quarters are those for families of clerks in the orderly room.

The defects in Gunners barrack are, close position, want of ventilation, no suitable water supply, defective paving and bad surface drainage, no ablution accommodation, and bad latrines. Probably the most satisfactory arrangement to make as regards this barrack would be to provide for the men it is intended to contain in the enlargement of the barrack we have proposed at the Moorish Castle, and to convert the Gunners barrack into married quarters.

## 8.—Town Range Barracks.

These barracks are situated in the town of Gibraltar. They consist of two long narrow blocks of building, placed in line and forming part of the side of a narrow crowded public street. The blocks are separated by a centre building in which are situated officers' quarters, the school room, orderly room, guard room, &c. The rock behind the barracks has been scarped to afford sufficient space for a narrow yard behind each barrack, the area of both yards being 17,622 square feet. These yards are separated one from the other by a wall, and up the face of the rock are placed the cook-houses, latrines, some of the married quarters, stores, workshops, &c., on narrow areas of ground cut out for the purpose. The barracks are about 45 feet above the sea level, and the rock itself rises immediately behind them by a very steep slope to a height of 1,200 or 1,300 feet, cutting off all ventilation on that side. The houses on the side of the street opposite the barracks rise as high as the roof and cut off the sea breeze from them. The site is a bad one, and cannot in any way be improved.

The barracks are partly occupied by infantry, partly by engineers. Each block is in two floors. The entrance to the rooms is from the narrow court yard behind, under an open verandah of stone, over which is an open wooden terrace and verandah reached by flights of stone stairs. The rooms are entered directly from the open air, and the lower floors, which are flagged with stone, are on the level of the court yard behind, although, on account of the fall of the ground, they are raised above the level of the street in front. The floors of the upper rooms are of wood.

The rooms as a whole are not good. They are dull and cheerless on account of their position, and they are very much overcrowded, as will be seen by the following table of accommodation:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| Nos. | | Ft. | Ft. In. | Ft. In. | | | | | Ft. In. | Ft. In. |
| 1, 2 each - | 20 | 38 | 20 0 | 10 10 | $411\frac{13}{20}$ | 38 | 12 | 7 | 6 0 | 3 10 |
| 3 | 20 | 36 | 20 0 | 10 10 | 390 | 36 | 12 | 7 | 6 0 | 3 10 |
| 4 | 20 | 38 | 20 0 | 10 10 | $411\frac{13}{20}$ | 38 | 12 | 7 | 6 0 | 3 10 |
| 5, 7 „ - | 20 | 38 | 20 0 | 10 10 | $411\frac{13}{20}$ | 38 | 12 | 7 | 5 6 | 4 0 |
| 6 | 20 | 36 | 20 0 | 10 10 | 390 | 36 | 12 | 7 | 5 6 | 4 0 |
| 8 | 20 | 38 | 20 0 | 10 10 | $411\frac{13}{20}$ | 38 | 12 | 7 | 5 6 | 4 0 |
| 9, 10, 11 „ - | 20 | 38 | 20 0 | 10 10 | $411\frac{13}{20}$ | 38 | 12 | 7 | 6 0 | 3 8 |
| 12 | 20 | 36 | 20 0 | 10 10 | 390 | 36 | 12 | 7 | 6 0 | 3 8 |
| 13, 16 „ - | 20 | 36 | 20 0 | 10 10 | 390 | 36 | 12 | 7 | 5 7 | 3 9 |
| 14, 15 „ - | 20 | 38 | 20 0 | 11 6 | 437 | 38 | 12 | 7 | 5 7 | 3 9 |
| Total - | 320 | — | — | — | — | — | 192 | — | — | — |
| Guard Room 4 cells each - | — | 22 | 11 6 | 12 0 | — | — | — | 2 | 5 3 | 3 0 |

*Overcrowding.*—Each room contains a third more beds than it ought to hold in accordance with the new regulations for home stations; but it would be much safer in such a locality and climate to reduce the numbers to 12 beds per room, which would give less than 700 cubic feet per bed. Such a reduction would improve the health of the troops most materially.

*Ventilation.*—Each barrack room has windows on two opposite sides. There are no fireplaces. The ground-floor rooms have no special means of ventilation, although a very curious substitute has been provided. The windows are all too low to permit the space under the ceilings to be ventilated any way except through chinks in the boards into the rooms above. The upper part of the windows for six or eight inches in depth is however louvred with wood, but as the glass frames, which open on hinges, are made to fit the window from top to bottom, they of course cover the louvres when they are closed. So that when the windows are open the louvres are also open, when they are not required, and when the windows are closed and at the time when the louvres are required, the louvres are closed also. The louvres diminish the light and are of no use whatever for ventilation. Each lower room requires louvred shafts carried from the corners above the roof of the barrack, as in Plan X., and inlets at both sides. These should be obtained by independent openings close to the ceiling, and the louvres in the windows should be removed to increase the light.

The upper rooms have an open roof, and the division wall between two adjacent rooms is not carried quite up to the top. Over this vacant area a large square louvre is carried up above the roof and affords sufficient outlet; but there are no inlets except the wooden louvres over the windows, which, as already stated, are open only when the windows are open. In these upper rooms, independent inlets for fresh air should be made on both sides under the eaves, and the louvres over the windows should be removed. The rooms are lighted with gas and require the burners to be ventilated.

The stone floors of the lower rooms should be changed for boarded floors with ventilation beneath.

*Ablution and Bath Accommodation.*—There are three ablution sheds, one for one division of the barrack, and two for the other division, situated in the yards behind. They have lean-to roofs and louvred sides. There are stone benches for basins; but no water laid on: there is a pump in the yard from which water is obtained. Foul water is removed by a small surface drain to the main sewer. There are no baths. The means of cleanliness are deficient. The ablution sheds should be provided with fixed basins, as in Plan XV.

*Cook-houses.*—There is a cook-house for each wing, built on the rock above, and reached by a stone stair. The buildings are octagonal shaped with the chimney in the centre. In each there are four boilers and one brick oven, and the ventilation is ample. But great saving of fuel would result from substituting the new steel boilers and oven for the present cooking apparatus. Water for cooking has to be carried.

*Women's Wash-house.*—This is of the usual construction, and has only a grate and boilers, but no fixed tubs or other conveniences. Washing is said to be done by the married people at their own quarters.

*Water Supply.*—In each yard there is a large tank filled with rain from the roofs for supplying the barracks. These tanks are so placed as to be very liable to pollution from surface drainage falling into them. The manholes into the tanks should have raised curbs all round, the covering stone should fit very closely, to prevent as far as possible the influx of foul surface drainage, and the rain water should be passed through a filter before entering the tank. In one of the yards there is also a well yielding brackish water unfit for use. There is of course no water laid on for any purpose. The source of the supply and its means of distribution are alike objectionable.

*Drainage.*—The courts are paved with rough boulders, and are in a very bad condition Water lies among the stones and it is impossible to keep the surface either dry or clean. There are large offensive gulley grates in the middle of each court, which are dangerous neighbours at all times, but especially when west winds prevail, and blow up the ends of the sewers. When this happens sewer air is poured into the barrack yard.

The courts require flagging and channelling to the gulley grates, and these again should be reconstructed and properly trapped so as to prevent nuisance.

The general drainage of these barracks and of the district has been bad for very many years, and appears to have had no inconsiderable influence in determining the outbreak of yellow fever in 1829, the first case of which appeared in the district above the barracks, which was drained into a main sewer loaded with filth, into which the barrack was also drained.

This is one of the weak sanitary points of the town, although there are the most

ample facilities for carrying out a perfect system of drainage, if they be only taken advantage of.

*Latrines and Urinals.*—There is a set of these for each barrack, built on the rock behind, near the cook-houses. They have the usual defects. The troughs are deep, and water does not stand in them. They are in fact not supplied with water, as all the water allowed to cleanse them is brought in commissariat carts, and carried to the latrines by hand labour. Consequently the latrines are imperfectly washed out without being really flushed, and the filth is carried into unflushed main sewers with which the barrack gulley grates communicate. The buildings are dark, not sufficiently ventilated, and the whole arrangements most offensive. In this as in other cases improved latrines and better drainage are contingent on a better water supply. Macfarlane's or Jennings' latrines, Plans XII. or XIII., should be substituted for the existing troughs, divisions and half-doors provided for the seats, and the buildings should be better ventilated and lighted.

The urinals are close to the latrines, and require reconstruction with impervious material, and a water supply, as in Plans XIII. and XIV.

*Cleansing.*—There are no ashpits. Iron boxes are used instead, and the refuse is removed daily.

*Married Soldiers' Quarters.*—These are partly in small cottage buildings on narrow ledges in the rock above the barracks, partly in barrack rooms which are occasionally misappropriated for the purpose. They vary in character, some are not so good as others. In one instance the ventilation from the tailors' and shoemakers' shops comes out on the level of the cottage floors directly under the doors and windows. This admits of remedy by ventilating the shops at the ridge, and closing up the present openings.

The serjeants' rooms in the barracks have no fire-places and no ventilation. There is a good serjeants' mess, with kitchen, ventilated through the roof.

*School Room.*—There is a good new school room in the centre of the line of building, with sufficient roof ventilation. It has an old pattern grate and requires a ventilating one. The adjoining schoolmaster's quarter is dark and not good.

*Workshops.*—The provision of workshops is not very good. One of the armourers' shops is too small. The tailors' and shoemakers' shops are built against the rock. All require ventilation.

*Guard Room and Cells.*—The guard room has an old pattern grate. The ventilation is deficient. The cells are close under the rock; all are dark. The inner ones have no light whatever from without, are very bad, and unfit for occupation.

We may sum up the sanitary defects of the Town Range barracks as follows:—

Unfavourable position, bad drainage, and rough defective surface paving, overcrowding, deficient ventilation, stone floors in lower rooms, no fireplaces, bad latrines and urinals, bad water supply, insufficient means of cleanliness.

## 9.—Hargreaves Barracks.

This barrack, at present occupied by the Royal Engineers, is situated at the south end of the town of Gibraltar, close to Charles V. wall, at an elevation of about 65 feet above the sea level. It consists of two parallel blocks of building projecting from the hill side at right angles to its plane, with the parade ground, 3,465 feet in area, between them, and overlooking the town below. Both blocks are two floors in height towards the parade ground, but on account of the nature of the ground the northern block has a floor below the level of the parade ground, occupied as a school room, store, &c.

The ground floor on one side the parade ground is occupied by the guard room, lock-up, reading room. The ground floor on the opposite side is used as a dining room and a barrack room. These have flagged floors several inches below the surface level of the barrack yard outside; but being built against the main escarp of the town, they are considerably above the level of the ditch. They are cold and damp, especially in winter. The principal barrack rooms are on the upper floor of both blocks. They are reached by wooden terraces on the level of the roadway which passes between the barrack and the hill side behind. Each room occupies nearly the whole upper floor, and has a serjeants' room at one end.

One of the rooms has five windows on each side. It is carried up into the roof and has a dormer window above. The other room has windows at each end and along the sides; only the windows facing the north are glazed. Those on the south side have wooden shutters only.

The following table gives the accommodation :—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| No. | | Ft. | Ft. in. | Ft. in. | | | | | Ft. in. | Ft. in. |
| 1 | 60 | 108 | 18 6 | 12 6 | 378 | $31\frac{3}{10}$ | 37 | 8 | 4 10 | 3 0 |
| | | | | | | | | 2 | 2 6 | 3 0 |
| | | | | | | | | 5 | 4 6 | 3 0 |
| | | | | | | | | 1 | 3 0 | 3 0 |
| | | | | | | | | 2 | 2 2 | 2 6 |
| 2 | 40 | 73 | 18 6 | 17 0 | 576 | $33\frac{1}{3}$ | 38 | 12 | 5 0 | 3 2 |
| 3 | 20 | 50 | 18 0 | 9 4 | $406\frac{5}{10}$ | 45 | 13 | 1 | 3 0 | 3 10 |
| | | | | | | | | 2 | 2 2 | 1 6 |
| | | | | | | | | 3 | 4 6 | 3 7 |
| | | | | | | | | 2 | 4 3 | 2 6 |
| 4 | 11 | 25 | 18 0 | 9 4 | 368 | 40 | 6 | 2 | 4 6 | 3 7 |
| Total - - | 131 | — | — | — | — | — | 94 | — | — | — |
| Guard-room - | 4 | 18 | 15 0 | 8 9 | — | — | — | 2 | 5 0 | 3 2 |
| Cells, 4 - - | — | 7 | 5 0 | 7 0 | 245 | — | — | - | - - | - - |

*Overcrowding.*—This barrack from its construction and local position, whereby it is freely exposed to the breeze and easily ventilated, ought to be healthy with 600 cubic feet per man. We should propose this amount, and to allot the men as follows; No. 1 room 37 men, No. 2, 38 men, No. 3, 13 men, No. 4, 6 men, instead of the present numbers. The four cells would have hardly space enough for one man if they were all thrown together.

*Ventilation.*—The room with the open roof and dormer window is well ventilated. The other room with the ceiling has four ventilators ending in louvres above. This room is not so well ventilated as the other, and requires inlets along each side and at the ends close to the ceiling. The rooms have no fireplaces. They are lighted with gas, the burners of which require ventilation to remove the products of combustion.

The men's room and dining room, on the ground floor, require shafts carried above the level of the roof. The ground floor rooms, which are paved, should have boarded floors with ventilation underneath.

*Ablution and Bath Accommodation.*—The ablution room is a very uncomfortable wooden shed erected at the end of the parade ground. It has stone benches and louvred sides, but no bath. Water is obtained from a tank in the middle, and the waste water runs into the privy drain to assist in flushing it. The present arrangements are insufficient for cleanliness. The place ought to be entirely re-constructed, as in Plan XVII., and a bath at the same time provided.

*Cook-house.*—There is an octagonal cook-house with six boilers and a brick oven, in so bad a state of repair that it has had to be pulled down. The new steel boilers and oven, Plan XVIII., are required.

*Women's Wash-house.*—This place has boilers and a stone bench to set tubs on, but no other conveniences.

*Water Supply* is derived from a large tank behind the serjeants' quarters, and a smaller one in the yard. The supply is insufficient, and it is not laid on. The water should be passed through a filter before it reaches the tank.

*Drainage.*—The paving and surface drainage of the court were both defective. The surface is roughly paved and insufficient for permitting the water to run speedily away. There is also an open offensive gulley grate at the end of the court.

*Privies and Urinals.*—The privies are situated in a small court at the end of the north barrack block and below its level; they are simply troughs over a drain 14 or 15 feet below. They are most offensive and unwholesome, and require entire reconstruction on Macfarlane's or Jennings' plan. The urinals are outside, and are better cleansed than many others.

*Cleansing.*—All refuse is collected in iron boxes and removed daily.

*Married Quarters.*—These are situated a little above the barrack, on the opposite side of the road. They are much better than usual, but by no means what they ought to be. The latrine belonging to these quarters is badly constructed and offensive.

*School Room.*—The school is under the northern block at a lower level. It is in an unhealthy position, as the earth of the barrack square is against its back wall. The school has an ordinary grate, and there is a ventilating opening into the chimney and another outlet into the orderly room above; this should be closed, and a proper outlet

shaft 10 inches by 12 inches should be carried above the roof of the barrack, and a large-sized Sherringham's ventilator put in the outer wall close to the ceiling, to serve as an inlet.

*Workshops.*—The tailors' shops are in the same situation as the married quarters; they require ventilation.

*Reading Room.*—The reading room, which is entered from the barrack square, is not a very good room. It has no ventilation and requires a shaft, and inlets on opposite sides.

*Guard Room, Lock-up, and Cells.*—The guard room has no ventilation except the air which comes through a perforated shutter. It requires a ventilating grate and a shaft through the roof. The lock-up has only a ventilating beam carried along the roof; it requires a shaft in addition. There are four small cells at one end of the yard below the level of the roadway. They are ventilated, but so very small as to be unfit for their purpose. They have each only 245 cubic feet of contents.

Hargreaves barrack has, perhaps, the best rooms of any barrack in the town. It is well exposed to the winds, and every part of it requiring ventilation can easily be ventilated.

Its chief defects are, bad drainage and bad latrines, insufficient means of cleanliness and insufficient water supply, defective surface paving and drainage of the barrack square; want of proper cooking arrangements, want of fireplaces and of wooden floors on the ground-floor rooms.

This is the last barrack within Charles V. wall, and before proceeding to describe those outside the wall, we shall notice briefly the neutral ground camp and the detached guard rooms in the north division.

### 10.—Neutral Ground Camp, and North Division Guard Rooms.

There is an encampment on the Neutral Ground, consisting partly of old wooden huts, and partly of tents, occupied by men engaged in rifle practice. The huts are many of them of a very miserable description, and hardly fit for occupation. Some of the worst of them are tenanted by married people, and afford about the most wretched accommodation anywhere to be met with. It is hardly possible to improve them. All that can be done is to see that the ground about them is kept perfectly clean and well drained, and that the huts are ventilated and frequently limewashed. Better accommodation should be afforded both for the troops and married people at this point, with as little delay as possible.

*Main Guard.*—This building is in the middle of the town. The men's guard room is of a good size, with a verandah in front, windows and openings into a yard behind. There are no special means of ventilation. It requires a shaft, inlets, and a remodelled fire grate. There is room for non-commissioned officers.

The lock-up is in the yard behind, and there are three large cells in the same place used for civilians as well as for military prisoners. These have paved floors and guard beds. A police officer lives on the spot.

The latrine and urinal are of the usual form; they require reconstruction on Macfarlane's principle.

*North Front Guards.*—There are a number of these; some with prisoners' rooms, some without. All have fireplaces to enable the men on guard to cook. The grates are of a very rough construction, and waste much fuel. A proper fireplace with oven should be provided for each of these guard rooms, as the men must cook at them. Grates similar to those made for married quarters, or, rather larger, like those put up in the Woolwich guard rooms by Messrs. Benham, would be suitable. The floors are paved, and the pavement under the beds is often rough and dirty. The beds do not fold up, and the space beneath cannot be properly cleaned. There is generally no glass to the windows, and no means of ventilation when the shutters are closed. They require louvres in the roof. Water is carried by carts. The latrines are all bad, and require re-construction, and there is a general deficiency of means of ablution.

These guard rooms require good ventilation, cleanliness, and means of cooking.

### 11.—Jumpers Bastion.

This is a recently-constructed work projecting beyond the line wall, between the Ragged Staff and Careening bay. It is built on the water level, and as the ground immediately behind it rises to some height above the sea, the whole work is below the level of the ground on the land side, and is in fact a deep well, the area of which is about 1,000 square feet, without free circulation of air, out of which the casemates are entered.

The battery is over the rooms.

There are 6 men's rooms built into the works on the sea face, besides a number of shorter casemates used for cook-houses, latrines, &c. The men's casemates are 60 feet in length, measured from the door to the end wall. Each has a door with a window on

either side, and a circular opening over the door. There are loopholes at the further end. There are no fire-places, and the floors are flagged. Being under the terreplein of the rampart, and close on the sea level, the whole of the rooms are damp in winter, and their occupants are continually exposed to injury from this cause.

The accommodation is as follows:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | Ft. | Ft. | Ft. | | | | | | |
| 6 each - | 32 | 60 | 19 | 15 | 534⅜ | 35⅝ | 20 | 2 | —. | — |
| Total - | 192 | — | — | — | — | — | 120 | — | — | — |

*Overcrowding.*—These casemates are part of a purely defensive work, and by far the best use of them would be to consider them in this light, and not as part of the barrack accommodation; because they have not been designed and constructed in such a way as to be fit for continual occupation. If they must be occupied, there should be no more than 20 men in each room.

*Ventilation.*—The external ventilation of the rooms is of course very defective, so far as construction goes, but on the other hand the work is between the sea and the open hill side, and no impure drainage passes into the subsoil to increase the impurity of the air. There are no special means for ventilating the casemates. Each room requires a shaft to be carried up at the further end to above the terreplein, and the circular opening over the door should be louvred and kept permanently open, Plan XI., Fig. 3.

Ventilating grates should be introduced if the rooms are to be occupied permanently, and the ground floor flags should be boarded over, with ventilation beneath.

There is no gas. Oil is served out for lighting, but it is stated that no lamps are issued with it.

*Ablution and Bath Accommodation.*—The lavatory is placed in a cell which was found to be too damp for its original destination. There is a wooden bench for basins, but no bath. The means of cleanliness are not sufficient.

*Cook-house.*—This is in a short casemate. It contains 6 boilers and a brick oven. It is deficient in ventilation. Water is carried in by hand for all purposes.

*Women's Wash-house.*—A shed with louvred sides is used for this purpose, but it has no conveniences.

*Water Supply.*—A spring of water, proceeding from the debris on the side of the hill above, comes out at the back wall of the bastion, and is received into a small tank, whence it is drawn for use.

*Drainage, Latrines, and Urinals.*—The surface drainage of the court is not very good on account of rubble stone being used for guttering. Flag stone properly channelled should be substituted for it.

The latrines are in a casemate, and are over a drain into which the sea washes. This method of cleansing is very imperfect, and gives rise to nuisance. A Macfarlane's or a Jennings' latrine should be introduced and supplied with water from the spring. The urinal is in the same place as the latrine.

*Cleansing.*—All refuse is removed daily.

*Married Quarters.* —The work is too confined to admit of married quarters in it. There were, however, married people, accommodated in two of the men's casemates, thereby crowding the others.

*Guard Room.*—The guard room is in one of the short casemates. It has a fireplace and an ordinary pattern grate. It requires ventilation similar to the other casemates.

The lock-up room is very small for the purpose.

The removeable sanitary defects in these casemates are, defective ventilation, want of fireplaces, overcrowding, defective surface drainage, bad latrines, flagged floors.

### Guard Rooms.—Ragged Staff.—South Sheds.—New Mole.

The guard rooms in this neighbourhood vary in character. The poorest of them is Ragged Staff guard. All are ventilated. The latrines of all of them are very bad. Those at Ragged Staff and New Mole are over cesspits. The latrine at the South Sheds guard room is over an open drain, and is washed out with water. There is a serjeant's quarter next to it, in which much nuisance is experienced from the latrine. In this case a water latrine should be provided, and at the other two guard rooms the privies should either be removed to a distance, or they should be drained and converted into water latrines, which could be easily done.

## 12.—Rosia Casemates.

These casemates are the most southern of the bomb-proof barracks in the line wall. Their position as regards the surrounding levels will be best understood by supposing that the rock at this point presented a vertical escarpment 35 feet high, with the sea-shore at its foot, and that the line of rooms had been built with their backs to the sea and their face to the escarpment, a few feet distant from it. The top of the upper floor casemates forms the terreplein of the rampart. The local position is much the same as that of Jumpers Bastion, except that Rosia casemates are deeper below the surface of the ground, and in a much closer and more damp situation. The rooms are in two floors, the upper floor being reached by a stone terrace, and the lower from a narrow sunk yard 35 feet deep, in which the air is always stagnant. The lower rooms have paved floors, and the upper rooms are boarded. There are no fireplaces. The casemates are very damp in winter.

Each room has a door with a window on each side, a fanlight over the door, and four loopholes through the outer wall. The rooms, especially those on the lower floor, are dark and very damp, and the whole place is the reverse of comfortable. It was occupied by married people at the time we were there.

The following is the accommodation:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | Ft. | Ft. | Ft. | | | | | Ft. In. | Ft. In. |
| 6 each - | 12 | 24 | 18 | 12 | 432 | 36 | 6 | 2 | 5 4 | 3 3 |
| | | | | | | | | 1 fanlight over door. | 1 6 | 3 0 |
| Total - - | 72 | — | — | — | — | — | 36 | — | — | — |

*Overcrowding.*—Considering their position, these rooms are greatly overcrowded. The remarks we have made in regard to the casemates in Juniper's bastion, apply more forcibly to these. They are indeed hardly suitable for human dwellings, on account solely of their position. If they must be occupied the inmates should be reduced to one half the regulation number.

*Ventilation.*—For ventilation a small shaft has been carried from above the door to the top of the work, but being at the wrong end of the room, it leaves the air stagnant at the other end where ventilation is most required, and it is of no use. The lower rooms might have a shaft from the ceiling carried up into the arched space of one of the loopholes of the room above, which arched space should be divided off from the room above, and left open to the outside. To ventilate the upper rooms, shafts should be carried up from the ends opposite the doors, or an opening made in the wall and through the soffit of the arch. Permanent louvred inlets for air should be provided over the doors. The ventilating arrangements are those shown on Plan XI., Fig. 4. Ventilating grates should be introduced into the rooms. The rooms are lighted with oil, although close to the gasworks. The lower floors should be boarded, with ventilation beneath.

*Ablution and Bath Accommodation.*—None. There are open arches in which the men wash, in basins placed on stone benches. No baths. The means of cleanliness are insufficient.

*Cook-house.*—Is a small dark casemate with two old pattern boilers and a grate. There is no oven. As the casemates were occupied by married people the cook-house was used also as a woman's washhouse. The wet linen is hung across the narrow court to dry, thereby increasing the dampness and stagnation of the air. The improved steel boilers and oven, Plan XVIII., should be introduced.

*Water Supply.*—None. Water for all purposes has to be carted and carried down to the rooms by hand. Cisterns with water laid on should be provided.

*Drainage.*—The drainage of the small court yard is not sufficient, apparently on account of the gulley grate being too small. The court is flooded during heavy rains. This should be remedied.

*Latrines and Urinals.*—The latrines are on two floors and are over a drain into which the sea washes. The urinals are under the same roof. The places are close to the men's rooms, and very offensive. They require reconstruction as water latrines on Macfarlane's or Jennings' principle with water laid on.

*Cleansing.*—All refuse is collected and removed daily.

The sanitary defects in Rosia Casemates are, low, damp, unventilated position, overcrowding, bad ventilation, defective surface drainage, want of water, bad latrines and urinals, insufficient means of cleanliness and of cooking; damp rooms, and want of fire places.

As the place is occupied for married quarters it may be stated that the railings of the terrace are so far apart as to be very dangerous for children, who have occasionally fallen through.

### 13.—South Barracks.

This is a large barrack situated 130 feet above the sea level, on a spur of the rock, which juts out near the New Mole. A plateau of considerable extent has been obtained partly by levelling, partly by scarping the rock, and the position is open and exposed to all winds except those from easterly directions. The site is as healthy a one as could be obtained on the rock, but notwithstanding its advantages the principal medical officer informed us that there are more admissions from fever from South barracks than from most other barracks in the garrison. The causes of this greater liability are certainly not to be found so much in the site, as in conditions connected with the barracks themselves.

The men's accommodation is arranged in one single line of building, consisting of a centre and two wings, with a large parade ground in front. The officers' quarters are in two detached blocks of building, at the opposite side of the parade ground, but they do not interfere with the outer ventilation of the barracks. Behind the barracks is a rather narrow court yard bounded by the rock. The cook-houses, ablution rooms, stores, &c. are built in a line close under the rock, and the court yard is traversed by five parallel ranges of one-story buildings, which interfere materially with the free circulation of air behind the men's rooms, where it is so much wanted.

The barrack rooms are on three floors, and are of a very singular construction. Though nominally divided, they extend the entire length of each wing. They are 212 feet in length, by 22 feet in breadth, and are cut up into compartments by 15 arches, each 6 feet 8 inches wide, and 9 feet high, thrown across their breadth, which divide the space into 16 compartments, all connected by the archways and allowing the foul air to pass all over each floor. The practical result is that the rooms contain far too many men; that the ventilation is injuriously interfered with, and that a sufficiently free circulation of air cannot be obtained to keep the compartments healthy. Every wall constitutes an obstruction, and a more effectual method of preventing circulation of air in a given space could scarcely have been contrived. There are no fire-places. The ground floors are paved, and the ground behind is higher than the floor, and slopes towards it, so that much of the rain-fall is carried directly towards the lower floors, instead of away from them. This evil has been partly remedied by good channelling at the foot of the wall. But the only way to cure it, and to make the ground floor healthy, is to cut the earth away to the depth of at least 18 inches below the level of the floor, and to flag and channel the space carefully. The floor flags should be raised on piers with ventilation beneath, and the floors should be boarded.

The long rooms are divided into smaller ones by wooden doors or partitions in the archways and otherwise. There are altogether 22 rooms of this construction. Ten of the smaller ones are used for other purposes, and the remaining 12 are occupied as barrack rooms.

The following table gives the details of the accommodation:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | Ft. | Ft. | Ft. In. | | | | | Ft. In. | Ft. In. |
| 12 each - | 58 | 106 | 22 | 10 6 | $422\frac{5}{29}$ | $40\frac{6}{29}$ | 40 | 16 | 5 10 | 3 0 |
| Total - - | 696 | — | — | — | — | — | 480 | — | — | — |

*Overcrowding.*—The cubic space per man given in the table includes that occupied by the partitions, and if this be deducted, the actual space per man will be reduced to little more than 400 cubic feet.

Considering its structure this barrack is very much overcrowded. At the very least 18 men should be removed from each room, allowing 600 cubic feet for the remainder; but it would be much safer to afford more space than this reduction would give.

*Ventilation.*—The upper-floor rooms have louvres in the roof, but no inlets for fresh air. They require a louvred ventilator in each side of each of the compartments.

The lower rooms have no ventilation, or rather they are provided with the same useless arrangement as that already described at the Town Range barracks, namely, at the top of each window frame there are wooden louvres, which are always closed when the

windows are closed, and only open when the windows are open, and when the louvres are not required.

Each compartment of the ground and first floor rooms should have a shaft, carried from the ceiling above the roof of the barrack, and on the side opposite that on which the shaft is placed, there should be a louvred ventilator to serve as inlet placed in the wall over the window and close to the ceiling. These inlets should be placed on the side facing the sea, to receive the full benefit of any breeze.

The rooms are lighted with gas, and require ventilated burners.

*Ablution and Bath Accommodation.*—Two ablution rooms of recent construction are in the yard. They have slate benches, very much inclined, with a deep gutter between them and the back. There is no water laid on, and no bath. The ablution rooms require louvres in the roof for better ventilation, and to be fitted up with proper basins and baths, as shown in Plans XV. and XVI.

*Cook-houses.*—There are four cook-houses with 27 boilers among them, two brick ovens, and one iron oven. The latter is stated not to bake. The new steel boilers and oven, Plan XVIII., should be substituted. The cook-houses require ventilation through the roof by shafts 12 inches square.

*Women's Wash-houses.*—These are open sheds with boilers. They were formerly ablution sheds. One of them has been converted into a canteen, a narrow and very comfortless place. The wash-houses require fittings.

*Water Supply.*—Water for the use of the barracks is obtained from four tanks and four wells. It has all to be carried by hand. The water should be passed through a filter before entering the tanks.

*Drainage.*—The barracks are drained by a sewer to Rosia bay. The surface drainage of the courts behind is defective on account of the rough nature of the pavement. Rapid passing away of all surface water is absolutely necessary in these yards, and it would be well to pave them with close-fitting square sets at the earliest opportunity. The gratings are said to be trapped.

*Latrines and Urinals.*—The latrines are of the ordinary construction. The buildings are dark, and without sufficient ventilation. There is no water for the troughs; all has to be carried by hand. The urinals are under the same roof, and the whole arrangements are offensive and unwholesome. They require reconstruction on Macfarlane's or Jennings' principle, with water laid on.

*Married Quarters.*—This class of accommodation is very deficient in amount, and, as already stated, Rosia casemates were used for married people at the time we were there. The buildings running across the barrack yard behind are partly devoted to this purpose. These are on the ground floor, the floors are flagged, the rooms are back to back, without thorough ventilation. They have fireplaces, and gas is laid on. All the rooms require louvres in the roof for ventilation, and boarded floors. The quartermaster serjeants' quarters also require ventilation. The serjeants' mess is over the kitchen, and requires thorough ventilation to keep it cool.

*Reading Room.*—A portion of one of the upper-floor barrack rooms has been made into a reading room. Ginger beer, coffee, and writing materials are sold in it to the men, and the profits pay for the newspapers. The accommodation, although not of a very attractive kind, is very much appreciated by the men.

*Schools.*—The reading room is used also for a school, but a chapel school is being built. There is an infant school in the back yard. It has a stone floor and no ventilation. It opens into the schoolmistress's quarter.

*Guard Room and Cells.*—The lock-up and guard room are on each side of the entrance. They have fireplaces and paved floors. The guard bed is fixed, and cannot be kept clean beneath, and the space becomes a receptacle for dirt.

The cells are in the back yard. They are very small. The floors are paved, and the cells have openings for ventilation.

The cardinal defects of these barracks lie in their construction, want of ventilation, and great overcrowding. These are the causes to which the fever cases are mainly attributable. The privies are bad. There is no proper water supply. The surface paving of the back court is defective, and the surface of the ground is above the level of the lower room floors, which are flagged instead of being boarded. There are no fireplaces. Almost every corner of the buildings and outhouses requires ventilation.

The latrines belonging to the officers' quarters are a great nuisance from want of water. They should be reconstructed as water latrines on Jennings' principle. And the officers' mess is, at times, intolerably hot from want of a verandah to shade the face of it from the sun.

### 14.—Rosia Barracks.

These barracks consist of the upper floors of two large buildings, one of stone and bomb-proof, the other of wood. They belong to the Royal Navy and were originally

built as stores, the ground floors being still used for the purpose. According to the present arrangement they can be reclaimed at any time by the Royal Navy. They are situated at the foot of a perpendicular cliff overlooked by the Naval Hospital, and about 40 feet above the sea level. The stone building contains one large barrack room, the roof of which is supported on pillars and arches forming five aisles. Between certain of the arches there are bulkheads of wood, partially dividing the area into a number of compartments in which the beds are placed. The floor is of stone, and there are windows on all sides. At the time of our inspection this room was occupied by 104 men, at about 1,000 cubic feet per man.

The wooden building is arranged in a somewhat similar manner. There are wooden pillars with bulkheads, with the beds arranged among them.

The rooms are spacious and airy, and, although not possessing all the requisites of barrack rooms, they present a favourable contrast when compared with nearly all the structures specially built as barracks in that most important element of health, free circulation of air.

The following table gives the accommodation :—

| Rooms. | Total Regulation Number of Men. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Total Number of men the Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Width. | Height. |
| | | Ft. In. | Ft. In. | Ft. In. | | | | | Ft. In. | Ft. In. |
| Rosia - 1 | 549 | 129 0 | 53 6 | 12 6 | 544⅔ | 30 | 494 | 28 | 3 0 | 5 4 |
| Rosia - 2 | | 129 0 | 53 6 | 15 6 | | | | | | |
| Rosia, Upper wood 1 | | 140 6 | 31 4 | 11 0 | | 43 | | 21 | 3 0 | 5 4 |
| Rosia, Upper wood 2 | | 140 6 | 31 4 | 12 6 | | | | | | |

*Overcrowding.*—These rooms should not have above 494 men in them to give 600 cubic feet per man.

*Ventilation.*—In the stone building the air is renewed solely by doors and windows. But the windows are in two ranges, one over the other, the upper ones being about 2 feet 6 inches from the ceiling. At the time we were in this room it was well ventilated, but nearly all the men were out of it, and the doors and windows were open. It would be very advisable, however, if practicable, to insert one large louvred shaft in the centre of the roof, to act as an outlet. This, with proper use of the windows, ought to be sufficient to keep the air in the room at all times fresh. There are no fireplaces, and the room is cold, damp, and comfortless in winter in consequence.

The wooden building has windows, and three large ventilators in the roof, which appear to be sufficient.

*Ablution and Bath Accommodation.*—There is no ablution accommodation for the men in the stone barrack, except stone benches under open arches, on which to place basins. The wooden barrack has a wooden shed building with a wooden bench for basins. No water is laid on; there are no baths, and the whole arrangements are insufficient for cleanliness.

*Cook-house.*—One cook-house placed close under the rock answers for both barracks. It is a brick building, badly paved, containing 12 boilers and a brick oven, which is stated not to bake. The cook-house is long, narrow, and dark, and smokes on account of its position. The new steel boilers and oven are required. All water has to be carried by hand.

*Women's Wash-house.*—Is at the ablution room, and is very bad.

*Drainage, Latrines, and Water Supply.*—The barracks are drained to the sea. The gulleys generally are trapped.

The latrines are in shed buildings placed on the side of the road opposite the barracks. They are of the usual unwholesome construction, and are so dreadfully offensive that the smell from them crosses the road at times, and becomes a public nuisance. They require entire reconstruction as water latrines on Macfarlane's or Jennings' principle.

*Water Supply.*—Water is derived from tanks and a well. It is not laid on for any purpose. It should be filtered before entering the tanks.

*Married Quarters.*—These consist of a row of small hut rooms.

*Guard room.*—The guard room has a small fireplace and a rough paved floor. The cells open into a yard and are ventilated. There are married quarters attached to the guard room.

The chief sanitary defects in Rosia barracks are, the bad state of the latrines, want of water supply, dampness in consequence of want of means of warming in winter, defective cooking apparatus, deficient means of personal cleanliness.

## 15.—Buena Vista Barrack.

These barracks occupy one of the finest sites on the rock. They are on a plateau 230 feet above the sea, having beautiful prospects in every direction and freely exposed to the winds on all sides. The men's rooms are in a single block, divided up the centre by a wide roomy staircase. The lower-floor rooms are entered directly from the parade ground by a door at each end of the room, and the rooms above have one door each opening on an outside terrace, which is reached from the staircase already mentioned. The block of building is bomb-proof, and the rooms are casemates, which from their position and construction are by much the best casemated rooms in the garrison. The lower rooms are paved, the upper room floors are of wood.

The following table gives the statistics of the accommodation:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | Ft. In. | Ft. In. | Ft. In. | | Ft. In. | | | | |
| Nos. 1, 3, 4, 6 | 37 | 61 4 | 18 0 | 14 6 | 432⅔ | 29 10 | 26 | — | — | — |
| Nos. 2, 5 | 36 | 61 4 | 18 0 | 14 6 | 444⅔ | 30 8 | 27 | — | — | — |
| Nos. 7, 9, 10, 12 | 33 | 55 4 | 17 10 | 16 6 | 490⅓ | 28 5 | 27 | — | — | — |
| Nos. 8, 11 | 32 | 55 4 | 17 10 | 16 6 | 508⅔ | 29 4 | 27 | — | — | — |
| Total | 416 | | | | | | 320 | | | |

*Overcrowding.*—These rooms ought to be healthy with about 600 cubic feet per man, and to give this amount, rooms Nos. 1 to 6 would accommodate 26 men each and the remaining rooms 27 men each.

*Ventilation.*—The lower rooms are provided with two doors having semicircular sashes over them, and two windows at each end of the room. The upper rooms have one door with a fanlight over it, and a window on each side of the door, and at the opposite end of the room are three glazed windows. The beds are arranged along the dead walls. The windows are too low to be of much use for ventilation, and there is a large space above the top of both doors and windows which becomes filled with foul air for want of an outlet. There are no fireplaces, and no other means of ventilation.

Each room should have a shaft of sufficient area carried from the ceiling above the roof, as in Plan X., Fig. 2, or if this be impracticable, there ought to be a large opening made at each end of the room under the soffit of the arch. This opening should be provided with louvres. The floors of the lower rooms should have ample ventilation beneath.

*Ablution and Bath Accommodation.*—The ablution room is part of a narrow, low, one-story building on the south front of the barracks. It is of recent construction, has slate benches, but no water and no baths. There were no gratings; they were said to be broken. The means of personal cleanliness are not sufficient.

*Cook-houses.*—There are two cook-houses in the rear of the one-story buildings already mentioned. There are five boilers in each, but no oven. The new steel boilers should be substituted and an oven introduced. The buildings require ventilation. All water has to be carried.

*Women's Wash-house.*—There is one wash-house with boilers and a wooden bench for tubs, but there is no water laid on, and no conveniences. These should be provided in the manner already described.

*Drainage.*—The drainage of this barrack appears not to be completed, and part of it is discharged on the face of the rock, creating nuisance. This should be corrected, and the privies and other buildings properly drained.

*Latrines and Urinals.*—The latrines are constructed with troughs, and have the usual defects. The soil falls over the cliff and finds its way to the sea. A proper drain is being constructed. The latrines require a water supply, and they should be reconstructed on Macfarlane's principle.

*Cleansing.*—There is an ashpit, cleansed daily. It ought to be abolished and the refuse collected in an iron box. In wet weather water drains from this ashpit on to the surface of the parade ground.

*Water Supply.*—Water is derived from an underground tank, the cover of which is fitted imperfectly, allowing impurities to fall in. This defect should be remedied, and a filter provided to pass the water through before it enters the tank. The supply is insufficient, and not laid on for any purpose.

*Married Quarters.*—There are separate rooms inhabited by married non-commissioned officers, but there are no quarters for married soldiers.

The sanitary defects requiring removal in Buena Vista barracks are, want of ventilation,

overcrowding, want of fireplaces, flagged floors, defects in drainage and latrines, want of proper water supply, insufficient means of cooking.

*Buena Vista Hut Barracks.*—These stone huts are situated on sloping ground below the barracks, in a place where space is very much required, and where two-story buildings might have been easily erected. As the huts are only on one floor they are very much crowded together and cover double the ground that was necessary. They are arranged in narrow parallel lines, with other huts built across the openings of the lines, thereby obstructing the ventilation. These huts were not completed when we inspected them, but they are built on an improved plan, to give 600 cubic feet per man. They have porches with space for night urinals built out from them, ventilating grates, and inlets at the eaves, but the ridge ventilation has been omitted, and the windows are too small. The designs for these huts were sent out from England, and contained the necessary sanitary details. But the selection of the site, the manner in which the huts have been arranged, and the omission of the sanitary details we have mentioned, was done on the spot, affording a marked illustration of how practical unacquaintance with sanitary principles may spoil a good design in the execution.

## 16.—Windmill Hill Barracks.

The troops stationed on Windmill Hill have three classes of accommodation:—1st, Windmill Hill barracks; 2nd, wooden huts; 3rd, a building called the Fuze house used as barracks for artillery. The huts and fuze house are situated on a plateau below the level of the barracks proper and at some distance from them.

Windmill Hill barracks are old badly-constructed barracks situated on a terrace of rock cut out to receive them at an elevation of 350 feet above the level of the sea The building runs about east and west, and faces nearly south. The ground slopes from it rapidly to the south, but on the north side the southern end of the lofty ridge of the rock of Gibraltar rises far above it. The terrace on which the barrack is situated is so narrow that only a few feet of space intervenes between its back wall and the rock above, and even this limited space is encroached upon by an arched verandah and terrace, where it is not only not wanted, but where it is a serious interruption to ventilation. This should be removed altogether, and a light verandah and terrace erected along the south front, where it will afford shelter from the sun, which is very much required. Besides, the freer circulation of air consequent on its removal will materially improve the ventilation of the barrack, and keep the air behind it dryer than it is at present.

The ground behind part of the barrack is on a level with the floors of the lower rooms; but a deep catch-water drain has been made at the foot of the rock to cut off the rain-fall and divert it from the barrack. It would however be highly advantageous to lower the surface a foot below the level of the floors, to dispense with the present boulder paving, and substitute for it well-fitting square stones or flags sloped from the building towards the drain.

The flagged floors should be boarded over, with ventilation beneath.

The rooms are low and narrow, with small low windows. They are entered from the verandah behind, through an interior porch common to two rooms. They are in two floors, the terrace above the lower verandah forming the means of entrance to the upper-floor rooms.

The whole barrack is very much overcrowded, as will be seen by the following table of accommodation:—

| Rooms. | Total Regulation Number of Men. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Total Number of Men the Rooms should contain | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| 1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 | 402 | Ft. In. 43 2 | Ft. In. 17 2 | Ft. 10 | 288½ | Ft. In. 29 4 | 170 | — | — | — |
| 4, 5 - - | | 35 8 | | | | | | | | |

*Overcrowding.*—If this building were thoroughly improved, each man would have space enough at 600 cubic feet. The present crowding is worse than almost any at home stations, and should be put an end to without loss of time. There is room in the present barrack for 170 men, which is the largest number it ought to contain. But the position is so healthy a one, that a considerable addition to the barrack accommodation might be constructed on the principles laid down above close to the present barrack.

*Ventilation.*—The present means of ventilation are doors, and windows, with a few air

bricks in the walls. The windows are much too small and ought to be enlarged and carried up close to the ceiling. There are also ventilating shafts made out of disused chimneys, and Sherringham's ventilators over the air bricks in the upper floors. Louvred ventilators are required in the lower floors, and in greater number, because notwithstanding the high and exposed situation of this barrack, the rooms, partly from bad construction, are very imperfectly ventilated, even with the present means. Enlarged windows, ventilating shafts in all rooms where they do not exist at present, and more inlets near the ceiling are necessary. But with the present overcrowding, hardly any means of ventilation short of sleeping in the open air would be sufficient for health.

*Ablution and Bath Accommodation.*—There is an ablution room behind the barracks, built against the rock. It is lofty, but the windows are much too low down for light or ventilation. There are two small grated openings at each end which require to be very much enlarged. There are stone benches and gratings, but no water laid on, and no bath.

*Cook-houses.*—There are two cook-houses, one at each end of the barrack range; they are supplied with 12 ordinary pattern boilers and one brick oven. The new steel boilers and oven should be provided for each cook-house. Water is not laid on.

*Latrines and Urinals.*—There are two latrines, one of which is flushed out every morning through a drain to the sea, the other is over a cesspit, and most offensive. This cesspit has to be frequently emptied, and the cleansing costs about 10*l.* each time. It requires drainage, like the other down the eastern face of the rock to the sea; both should have Macfarlane's or Jennings' latrines instead of the present arrangements, and the cesspit should be abolished. The urinals are a great nuisance. They should be reconstructed on Plans XIII. or XIV. with water for cleansing.

*School Room.*—A school room has been recently built a little below the barracks. It is an excellent building, except that the windows are too low for efficient ventilation, for which indeed no provision has been made in the construction. There should be louvres introduced in the roof, and louvred ventilators along both sides at the eaves.

The privy belonging to the school is over a cesspit. It requires reconstruction and drainage.

*Drainage.*—There is a main drain from the soldiers' barracks, built of masonry and carried down the face of the rock on the Mediterranean side, where it is discharged on the perpendicular face of the cliff to the sea, about 100 feet below. Another drain proceeds from the officers' quarters, and has no proper outlet. The sewage finds its way into crevices or over the surface, and occasions nuisance. This could easily be remedied by laying a small pipe drain to the sea.

*Water Supply.*—Water is derived from tanks, and is not laid on for any purpose. A water filter is required.

The chief sanitary defects of Windmill Hill barracks are as follow:— great overcrowding; deficient window space and ventilation; want of drainage for latrines, &c.; cesspits; defects in water supply; verandah on wrong side of barrack; earth behind on a level with the floors; deficient means of personal cleanliness.

*Hut Barracks, Windmill Hill.*—At some distance below the barracks we have described there is an extensive plateau of ground occupied by a number of Crimean wooden huts, partly used as men's quarters, partly as married quarters. They are generally in such a ruinous condition as not to be fit for occupation. Many of them are not weather-tight, and require shoring up to keep them from falling on their inmates. They are said to be "frightfully hot" in summer, and cold in winter, besides being unfit for habitation in wet weather. It would be quite a useless expenditure of money to attempt to do anything with them, further than may be required to keep out rain, until proper accommodation can be provided for their occupants.

Besides the bad state of the huts everything else is either deficient or bad. The arrangements for cooking, ablution, water supply, drainage, latrines, which are over cesspits, are all of the same temporary nature as the barrack accommodation, and all require reconstruction.

The site is a fine and healthy one and would afford space for barracks for a considerable body of men.

Several brick huts are used as stores, workshops, &c. They have no ventilation, and require louvres in the roof with inlets at the eaves.

*Canteen.*—The canteen is within the enclosure of Windmill Hill barrack. It is a dark, dirty, uninviting place, and has a stone floor.

*Guard Room and Cells.*—The guard room is very small. It is ventilated through the roof, and has a fireplace. The lock-up is also small. The cells are detached from the guardroom; they are too small, and require ventilation.

The officers' stable is insufficiently ventilated.

### 17.—Artillery Barracks, Windmill Hill.

This building is near the wooden huts. It consists of two rooms, built in 1794, and now used as barrack accommodation. There are windows on opposite sides; the floors are paved. There are fireplaces with small old pattern grates.

The accommodation is as follows:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| | | Ft. In. | Ft. | Ft. | | | | Ft. In. | Ft. In. |
| 1 room - | 12 | 37 6 | 18 | 15 | 843¾ | 56¼ | 1 | 3 0 | 2 6 |
| | | | | | | | 2 | 4 0 | 2 6 |
| 1 room - | 10 | 30 0 | 18 | 15 | 810 | 54 | 2 | 4 0 | 2 6 |

*Overcrowding.*—None. The rooms, on account of their airy position, afford space enough for their inmates.

*Ventilation.*—No special means of ventilation. Louvres in the ridge and inlets at the eaves on both sides are required. Ventilating fire grates should be introduced.

The floors should have ventilation beneath.

The position of the building is airy and healthy, but the ground outside is roughly paved, and the surface drainage not so good as it might be.

*Ablution Room.*—Is of the usual construction. Water is not laid on, and there is no bath.

*Cook-house.*—A small cottage building, with the floor roughly paved and dirty in consequence. Cooking arrangements consist of two boilers. No oven. Steel boiler and an oven are required.

The *Ashpit* next to the cook-house is in a ruinous state and too large: its contents are removed daily. An iron box would be much better.

*Latrines and Drainage.*—Merely a common privy over a cesspit. Very offensive. An open surface drain runs through the barrack yard, into which urine tubs are emptied. There is another very offensive drain close at hand which receives foul water from the kitchen. These surface drains are led to the face of the rock and their contents are discharged over to the ground below where they evaporate. They give rise to great nuisance in summer, and the effluvia from the privies can be detected all over the vicinity in certain states of the wind. A proper pipe drain is required.

This barrack requires ventilation, drainage, better water supply, entire reconstruction of privies as water latrines and better surface paving. Wooden floors are also needed for the rooms, and an improved cook-house.

### 18.—Defensible Barracks, Europa Point.

This is a block of bomb-proof building, consisting of four parallel casemates communicating with each other by lateral arches. It occupies an airy exposed position, about 45 feet above the sea level, and is detached from other buildings. One room is divided into a library and officers' kitchen. The floors are flagged, and there are no fireplaces. A covered verandah runs along both sides of the block. Taken as a whole the barrack accommodation is very good for a casemated building, except that from want of fireplaces the rooms are very damp and cold during winter. Oil is used for lighting.

The following table gives the accommodation:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Numbe of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | Ft. | Ft. | Ft. In. | | | | | | |
| 4 rooms - | 25 | 48 | 19 | 15 6 | 565½ | 36½ | 23 | — | — | — |
| Total - | 100 | | | | | | 92 | | | |

*Overcrowding.*—By removing two men out of each room there will be space enough for the remainder.

*Ventilation.*—The position of the barrack ensures good external ventilation. There are openings under the soffit of the arches at each end, and windows exposed to every wind, but the rooms are said to be scarcely sufficiently ventilated; some arrangement for

removing the foul air at night being necessary. A few additional louvred openings in the side and end walls, with a shaft through the roof of each casemate, would remedy this defect.

*Ablution and Bath Accommodation.*—There is an ablution room with a rough pebble floor, and stone slabs for basins, but no water supply and no bath. It requires roof ventilation.

*Cook-house.*—The cook-house is insufficiently ventilated, and requires a louvre in the roof. It has four boilers and a brick oven; for which the steel boilers and oven should be substituted. The meat store requires ventilation.

*Latrines, Urinals, and Drainage.*—The latrine is an ordinary privy over a cesspit. The urinal adjoins it. There is no drainage, and the place is most offensive. There are ample facilities for draining to the sea. The latrines and urinals should be drained, reconstructed, and supplied with water on Macfarlane's or Jennings' plan. The ablution room, cook-house, &c. have only surface drainage, and the water finds its way to the sea. A proper drain is required. Barrack refuse is removed daily.

*Water Supply.*—None except from a tank. It has to be carried by hand for all purposes.

*Married Quarters.*—There are some good quarters for married people in the neighbourhood; there is also a serjeants' quarter attached to the barrack rooms.

This barrack, notwithstanding its fine position, has recently been somewhat unhealthy, attributable mainly to deficient ventilation and the condition of the drainage. It is a little overcrowded, and would be safer with two or three fewer men per room. The ventilation should be increased, and the neighbourhood thoroughly drained. All open surface drains should be carefully cut in flagstone, with sufficient inclination to free them of water. The cesspit should be abolished, and the latrines properly constructed.

## 19.—New Hut Barracks, Europa Flat.

These new barracks are situated on a healthy site overlooking the sea, a little to the west of the Defensible barrack. They are built of stone, on an improved plan, to give 600 cubic feet per man, and are very good except in some minor points of detail. Some of the sites have been more or less dug out of the slope, so that the earth, although separated from the walls, rises a foot or two above the level of the floors. This should always be avoided; and the foundations raised above the adjoining levels. If, however, this advantage cannot be obtained, and sites must be partially excavated, not only should the earth be completely cut away to a sufficient distance to prevent damp, but the ground should be lowered at least a foot or 18 inches below the level of the floor, and the slopes flagged to afford rapid drainage.

The accommodation is as follows:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| | | Ft. | Ft. In. | Ft. In. | | | | Ft. In. | Ft. In. |
| 8 huts, 2 rooms each = 16 - | 24 | 51 | 20 0 | 14 3 | 600 | 42½ | 8 | 4 8 | 2 9 |
| N. C. Officers' rooms, 16 - | 1 | 14 | 9 6 | 14 3 | — | — | — | — | — |

Each hut contains two barrack rooms with two serjeants' rooms back to back (having each a grate with an oven) between them. These rooms are 9 feet 6 inches wide, and are too narrow for comfort. An additional width of a foot or 18 inches should be given in future huts. The floors are of wood raised from one to 6 feet above the ground, with free ventilation beneath.

Each barrack room has windows along the opposite sides, rather too small in area. There are ventilating inlets along both sides at the eaves; a ventilating fire grate, and ridge ventilation along the roof. The ridge appears to be hardly sufficiently raised, at least for summer, in such a climate. Any deficiency of ventilation can, however, be easily remedied.

*Ablution and Bath Accommodation.*—There is a large ablution room of the recent regulation pattern, with slate benches and water taps, with water laid on. It is paved and ventilated, but requires pegs. Crockery basins are issued to the men, but are apt to be broken. There is no bath, but one for salt water is about to be put up on trial.

*Cook-house.*—There is a large cook-house, lighted and ventilated, containing an improved Benham's apparatus intended for the whole hut encampment, which was originally designed and ordered to be built for 1,000 men. The local authorities only erected huts for 400 men on this site, and placed the others at Buena Viata. The cooking apparatus for 1,000 men was nevertheless put up at Europa flats, and is used for about 400 men, consuming about 320 lbs. of coal a day while cooking for that number. The quantity of fuel is hence much larger than would be necessary with improved steel boilers and ovens, or than would have been necessary with the present one had it been used for the number of men for which it was intended. Unless the barrack accommodation is to be extended on this site, it would be better to remove the apparatus to a barrack where the full number of men could be cooked for, and to put up the improved steel boilers and ovens instead.

*Drainage.*—All the fluid refuse of these huts is conveyed to the sea by underground drains, trapped, to an outlet 200 yards distant, formed of a curved iron pipe, which drops the sewage under the surface of the water.

The drainage of the officers' quarters, which are in a large old house at a short distance, is not good.

It is led to a crevice in the rock and there discharged. It requires examination and improvement, and to be conducted to the sea.

The roof of the officers' quarters leaks and requires repair.

*Latrines.*—Macfarlane's latrines have been erected, but there was not water enough for them. This defect was about to be remedied by raising water from the sea.

*Water Supply.*—Derived from a tank. It is insufficient in amount. The water should be passed through a filter before entering the tank.

These hut barracks are still incomplete and require gas for lighting, a day and reading room, and other conveniences. There are no married quarters as yet.

### 20.—Brewery Barrack, Europa Point.

This is a building originally intended for a brewery and not fit for a barrack. It forms three sides of a square. All the paving about it is of rough boulders, very bad and quite insufficient for surface drainage. The rooms are shed buildings, resembling the temporary accommodation available on field service rather than a place where troops should be permanently barracked.

The rooms on two adjacent sides of the square are used as barrack rooms. They have windows on both sides. One room has a fireplace and the other has two. These fireplaces have the old pattern grate.

The room on the third side is divided down the centre by wooden partitions to form separate berths for married people. There is a fireplace at one end of this room, and a tank has been constructed under part of it.

The passages have rough pebble pavement which cannot be kept clean. All the floors should be raised and boarded.

The following table shows the accommodation in this barrack :—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men each Room should contain. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | Ft. In. | Ft. | Ft. | | | | | | |
| 1 | 40 | 68 6 | 20 | 13 | 445¼ | 34¼ | 29 | — | — | — |
| 2 | 40 | 75 0 | 20 | 13 | 487½ | 37½ | 30 | — | — | — |
| 3 | 30 | 61 0 | 20 | 13 | 528⅔ | 40⅔ | 26 | — | — | — |
| Total - | 110 | | | | | | 85 | | | |

*Overcrowding.*—This barrack is overcrowded with its present occupants. Instead of the existing numbers, we would propose as follows :—Room No. 1, to contain 29 beds ; room No. 2, 30 beds ; and room No. 3, to contain 26 beds, which would give a little over 600 cubic feet per man.

*Ventilation.*—There are no means of ventilation except doors and windows. The latter are on opposite sides of the rooms. Ridge ventilation, together with inlets at the eaves along opposite sides of the room are required, and ventilating grates should be introduced instead of the present ones.

*Ablution and Bath Accommodation.*—There is no suitable ablution room. The place in use is an open shed, with benches. There is no bath, nor other convenience, and no water supply.

*Cook-house.*—The cook-house is at the corner of the barrack. It has a paved floor, three square boilers, and a brick oven. It requires roof ventilation, and should be provided with the new steel boilers and oven.

*Women's Wash-house.*—There is a place with no washing conveniences. It has an earthen floor, and is undrained.

*Latrine and Urinals.*—The men's latrine is a trough over the sea. Dirty water is allowed to pass through the trough. The building is too dark and requires more ventilation. The urinal is better than the most of such places, but it is close to the kitchen, and gives rise to nuisance. It should be removed to another site. The women's privy is over a cesspit. The barrack refuse is thrown on a heap close to the barrack. This is quite unnecessary and should be prevented. The refuse should be thrown into the sea.

*Drainage.*—The surface drainage is very bad on account of the nature of the paving. There is a main drain to the sea; it has a large untrapped opening for emptying slops into it close to the barrack rooms. This is a great nuisance and ought to be removed.

The entire drainage, including that of the surface, requires improvement. Part of it at present is discharged on the surface of the ground at a lower level and allowed to sink into the earth or evaporate.

*School Room, &c.*—A building erected for a store is at present used as a school. It requires a fireplace, more window space, and roof ventilation. The shoemakers' shop is in a small store, the floor of which is paved with pebbles and rough.

This place altogether is more fit for a brewery than a barrack; looking at it as it is, it requires reduction of inmates, ventilation, ventilating fire grates, wooden flooring, ablution and bath accommodation, surface flagging and draining, better latrines, better water supply.

## 21.—Europa Guard Rooms, &c.

*Europa Point Guard Rooms.*—There are several detached guards at Europa Point, which have certain defects in common. The privies are all in a bad condition and require reconstruction. The floors, generally, are covered with rough boulder pavement, instead of being boarded, and the ventilation is often deficient. They should be included in the general improvements required for the guard rooms of the garrison.

*Europa Pass Sheds.*—These sheds are at present occupied by married soldiers in default of better accommodation. They are either close to the rock, or are more or less under the level of the ground. They are very unhealthy, and in every way unsuitable for the purpose. The only thing to be done is to remove them altogether, a measure which would afford space for erecting a considerable number of proper quarters.

At a short distance from these sheds is a handsome new building for an infant school. But notwithstanding the very considerable cost incurred in the construction, no provision whatever has been made for ventilating it. It requires ridge ventilators and inlets at the eaves.

## 22.—Military Prison.

The military prison for the garrison is in two divisions, one in the Moorish Castle, the other in a special building at Windmill Hill. Both positions are healthy, but there is a considerable difference in the prisons.

The *Moorish Castle* division is close and confined in area, and the cells are some of them built against the rock.

They open on the external air. Water is derived from tanks, but is insufficient in amount, and the requisite quantity has to be carried during part of the year.

The latrine is flushed into a drain. There is an open drain and cesspit outside, which occasionally become very offensive.

The great improvements required at the Moorish Castle are drainage and water supply.

The *Windmill Hill* division is a regularly constructed prison with a central light and airy corridor, and the cells opening out of it on each side.

There are plenty of means of ventilating both corridor and cells. There is no warming apparatus. Although a subsidiary building has been recently erected, the prison is too small for the strength of the garrison, and the guard rooms are consequently crowded. 50 additional cells on the existing plan should be built with as little delay as possible.

The kitchen would require an additional boiler if this were done. But the new steel boilers should be introduced to save fuel. Here as elsewhere the drainage is defective, and should be improved, together with that of the barracks. In other respects the arrangements are sufficient for health.

### 23.—Detachment Barrack, Catelan Bay.

This barrack, situated close to the margin of the sea on the Mediterranean side of the rock, was destroyed by a fall of rock during a blasting operation, shortly before our visit, and the men were living in tents. It was a very bad barrack, and is to be replaced by a building more suitable for its object.

### 24.—Garrison Hospital, Gibraltar.

This hospital was built for the Royal Navy, about the year 1771, and has been lent to the Army since 1816, subject to certain reservations as to accommodation for commissioned and warrant officers of the navy. As the building may be reclaimed at any time by the department to which it belongs, we shall in the following report limit the improvements we have to recommend to points of immediate necessity.

The building faces the west, and occupies a platean of ground 130 feet above the level of the sea, at Rosia, in the southern division of the garrison. Its position is open to the west, and to a great extent so, to the north and south; but on the east side, towards the slope of the hill, the rock has been cut away to afford increased surface area, and as a consequence there is a section of the rock with a steep slope above it, rising as high as the roof of the hospital, a few yards only from its back wall, darkening the wards on that side, and interfering with external ventilation. Immediately over the slope the rocky heights of Windmill Hill rise several hundred feet, and cut off the winds coming from the Mediterranean; with this exception the site is open, airy, and not inconvenient for the garrison, with all parts of which it is connected by good roads.

The buildings consist of one large central block, containing the hospital proper. On the north side, and separated from it by an open space, are detached blocks of buildings used as quarters and stores; and on the south side, at a short distance from the hospital, there is a row of stores, at one end of which, close under the rock, are the hospital latrines. In the same row are stables, and also the dead house. A gateway divides these buildings in the middle, and outside it there is a separate detached block resembling, in structure, ordinary regimental cells, used as lunatic wards.

The hospital is built in a hollow square with closed angles. The outer front facing the west is 325 feet long. The outer length of the sides is 162 feet. The inner square is 145 feet long by 70 feet wide.

Outside the square at either end are two wings projecting backwards from the front to increase the accommodation, and between these wings and the walls of the square are narrow roughly paved courts. The construction is therefore not all that could be desired in point of health. It is not sufficiently simple to obtain all the advantages which might arise from the position of the buildings; and partly to this circumstance, partly to the close proximity of the high ground behind, and to defects in the drainage, is no doubt to be attributed the fact that the medical officers and hospital servants did not escape yellow fever during the last epidemic which visited Gibraltar. There are two floors of wards, one on the ground floor, the other above. Over the centre of the front there is a third floor used as quarters for sick naval officers, regimental hospital stores, &c.; and at each corner of the main building there is a third floor, forming a pavilion carried above the line of the roof, and used for sick wards, &c.

The principal entrance to the hospital is by a wide passage through the middle of the west front. A wooden terrace is carried round the inside of the square at the level of the upper floor. It is reached by four flights of stone steps, and affords the means of access to the upper-floor wards.

As originally constructed the general disposition of all the wards was as good as the plan admitted of, and closely resembled that of other naval hospitals. The wards were entered from the end, and extended from the entrance to the corners of the court, having windows on both sides, with the beds arranged along the walls between the windows, space being left for a fireplace.

The structure was simple, and allowed of circulation of air more or less efficiently throughout the building; but after the hospital was made over to the Army it was cut up into no fewer than six hospital establishments for regimental purposes. With this object wards have been divided, partitions run up, stores, kitchens, surgeries constructed, apparently without the slightest regard to the probable effect of the alterations on the ventilation of the buildings, and there are at the present time six kitchens, six surgeries, six sets of stores of various descriptions, and other offices in proportion, the existence of which is as detrimental to the health of the hospital as it is to administration and discipline.

There are at present 32 wards, numbered as 30 on the construction of the hospital, the statistics of which are given on the following table:—

| | No. of Wards. | Present Number of Beds per Ward. | Length. | Breadth. | Height. | Cubic Feet per Bed. | Superficial Area in Feet per Bed. | Number of Beds at 1,200 Cubic Feet each. |
|---|---|---|---|---|---|---|---|---|
| | | | ft. in. | ft. in. | ft. in. | | | |
| Ground floor. | 1 | — | 88 0 | 20 0 | 12 0 | — | — | 17 |
| | 2 | — | 88 0 | 20 0 | 12 0 | — | — | 17 |
| | 3 | 18 | 53 0 | 20 0 | 12 0 | 706 | 59 | 10 |
| | 4 | 16 | 57 6 | 20 0 | 12 0 | 862 | 72 | 11 |
| | 5 | — | 26 0 | 20 3 | 12 0 | — | — | 5 |
| | 6 | — | 26 0 | 20 3 | 12 0 | — | — | 5 |
| | 7 | 16 | 56 6 | 20 0 | 13 0 | 847 | 70 | 11 |
| | 8 | 18 | 53 3 | 20 0 | 12 0 | 710 | 59 | 10 |
| | 9* | — | 88 0 | 20 0 | 12 0 | — | — | — |
| | 10 | — | 26 0 | 26 0 | 12 0 | — | — | 6 |
| | 11 | 16 | 53 0 | 20 0 | 12 0 | 795 | 66 | 10 |
| | 12 | 20† | 80 0 | 20 0 | 12 0 | — | 80 | 16 |
| | 13 | — | 80 0 | 20 0 | 12 0 | — | — | 16 |
| | 14 | 17 | 53 0 | 20 0 | 12 0 | 748 | 62 | 10 |
| | 15 | — | 26 0 | 26 0 | 12 0 | — | — | 6 |
| Upper floor. | 16 | 34 | 100 0 | 21 0 | 17 6 | 1,080 | 62 | 30 |
| | 17 | 34 | 100 0 | 21 0 | 17 6 | 1,080 | 62 | 30 |
| | 18 | 18 | 53 6 | 21 0 | 17 6 | 1,092 | 62 | 16 |
| | 19 | 18 | 57 6 | 21 0 | 17 6 | 1,174 | 68 | 17 |
| | 20 | — | 20 9 | 27 0 | 11 4 | — | — | 5 |
| | 21 | 18 | 57 0 | 21 0 | 17 6 | 1,163 | 68 | 17 |
| | 22 | 18 | 54 0 | 21 0 | 17 6 | 1,102 | 63 | 16 |
| | 23 | 32 | 100 0 | 21 0 | 17 6 | 1,149 | 66 | 30 |
| | 24 | 20 | 67 0 | 19 6 | 17 6 | 1,143 | 65 | 19 |
| | 25 Upper | 10 | 27 0 | 27 0 | 15 0 | 1,093 | 46 | 9 |
| | 25 Lower | 10 | 27 0 | 27 0 | 11 4 | 826 | 46 | 5 |
| | 26 | 16 | 53 6 | 21 0 | 17 6 | 1,229 | 70 | 16 |
| | 27 | 24 | 80 0 | 21 0 | 17 6 | 1,225 | 70 | 24 |
| | 28 | 28 | 80 0 | 21 0 | 17 6 | 1,050 | 60 | 24 |
| | 29 | 18 | 53 6 | 21 0 | 17 6 | 1,092 | 62 | 16 |
| | 30 Upper | — | 27 0 | 27 0 | 15 0 | — | — | 15 |
| | 30 Lower | — | 27 0 | 27 0 | 11 4 | | | |
| | Total - 32 | 419 | — | — | — | — | — | 440 |

This table shows that out of 32 wards, 10 are misappropriated for other purposes, and that on the present allotment as to cubic space, the misappropriated wards would accommodate about 100 beds. Three of the wards will have to be taken for purposes of administration, so that the whole space added to the hospital by restoring the misappropriations will not count as increased ward space.

The misappropriated wards are occupied as follows:—No. 1 ward is subdivided into two regimental stores and a hospital serjeants' room.

No. 2 is used as a purveyors' store.

No. 5 contains a regimental surgery and waiting room.

No. 6 contains a hospital serjeants' room and a regimental medical comforts' store, with a passage between them.

No. 10 is used as a regimental surgery and hospital serjeants' room.

No. 13 is partly used as a chapel and reading room and partly as a regimental store.

No. 15 is partly used as a lobby and partly as a bedding store and orderly's room.

No. 20 is divided into a regimental surgery, an office, and an orderly's room.

The two wards, upper and lower, No. 30, are used as a regimental store, surgery, orderly's room, &c.

By restoring all these wards as hospital accommodation for sick, and allotting 1,200 cubic feet per bed, the hospital will accommodate 440 sick, a number not likely to be exceeded at any ordinary season.

Besides the proper ward accommodation there are seven rooms in the third floor of the centre of the front already alluded to; they are in reality rooms for sick naval officers, but are devoted in part to other purposes. The best of them, which would hold nine beds, is used as a hospital store by the Royal Artillery. Other two rooms are used by a hospital serjeant, and the remainder are used for officers and warrant officers of the Royal Navy, for whom they afford insufficient accommodation, and complaints have arisen in consequence.

* A bad ground-floor ward, partly used for prisoners. It is hardly fit for occupation.
† Part of this ward is cut off for a regimental pack store. The rest is used for sick.

The sick wards differ much in character; those on the ground-floor front are good, they face the west and have free external ventilation. The back ground-floor wards are enclosed between the inner court of the hospital and the rock behind, and are of an inferior description. They are dull, and there is very little movement of the air about them. Besides these disadvantages, they are built directly across the natural fall of the drainage from the rock above, apparently without any special provision for cutting off the water, and they are liable to damp, especially in the rainy season.

The wards on the ground floor of the sides are very inferior and hardly fit for sick. They receive their ventilation chiefly from a narrow court between the ward and the kitchen, where there is an offensive gulley grate, to which disease has been traced.

The upper-floor wards are generally the best, but two wards, 16 and 17, are built alongside each other, with doors and openings through the partition wall, and four rows of beds between the opposite windows. This faulty construction appears to be the result of a later addition to the hospital.

*Ventilation.*—The wards are almost all more or less deficient in window space and in means of ventilation. The windows generally are placed on opposite sides of the wards, but they are deficient in height in proportion to the height of the wards, and hence there is a space of about four feet between the top of the windows and the ceilings of the rooms from which there are no means at present of giving exit to the foul air. There is generally a similar space of four feet between the sill of the window and the floor. The wards on the upper floor have their ceilings generally carried up in the line of the roof, which is boarded inside, and in most instances advantage has been taken of this circumstance to introduce ridge ventilators. In some of these upper wards there is no ventilation, and this is also the case with all the ground-floor wards. The wards in the turrets at the angles are one above the other, and are reached by a stair within the ward, so that the foul air from the wards below passes upwards into those above, and there is no ventilation in the upper wards.

*Drainage.*—The facilities for drainage are most ample on account of the height of the buildings above the sea level.

The surface drainage and paving admit, nevertheless, of considerable improvement, especially in the narrow spaces between the buildings. The present imperfect paving should be relaid with flags, the channels for surface water carefully formed, and all the gulley grates trapped. The present rough paving renders proper surface drainage almost impossible.

*Water Supply.*—The water supply is derived from three sources; the roofs of the hospital, wells, and surface drainage. Water from the former source is stored in two underground tanks capable of holding 50,000 and 56,000 gallons respectively; it is used for the ordinary service of the hospital. The surface drainage, which is collected from the hill side above and behind the hospital, is stored in two small tanks, and is chiefly used for flushing the privies. The quantity is very limited, and in dry weather, that is during a great part of the year, the flushing cannot be done. Water for washing is obtained from two wells, but the supply is limited, and has to be raised and carried by fatigue parties.

The arrangements are very defective, but nothing efficient can be done to improve them until a suitable water supply is provided for the whole garrison.

*Water-closets.*—There are no conveniences of this kind for the sick of this large hospital.

There are instead, out-door privies, about 50 yards from the hospital, on the south side, at the end of a range of buildings used as medical stores. There is no covered communication between the privies and the hospital. There are several smaller privies within the hospital enclosure. They all communicate with sewers by means of which their contents are very imperfectly conveyed to the sea; they are all badly constructed, not supplied with water, and most offensive. These privies are washed out once a day by throwing water down them, but the smell from them nevertheless can be detected as far as the hospital, and in summer they are stated to become a very great nuisance.

They should be reconstructed as water latrines on Macfarlane's or Jennings' principle, and supplied with water constantly, so as to have water always standing in the troughs, and they should be flushed out by opening the valves as frequently in the day as may be required to keep them in a wholesome state. Sick or ailing men cannot frequent such places as these are, without great risk to health.

Proper water-closets should also be provided for the wards in the manner hereafter stated.

The urinals, of which there are two, are as bad as the privies. They require reconstruction, and to have water laid on for cleansing them.

*Ablution and Bath Accommodation.*—There is no ablution or bath room connected with any of the wards. Behind the hospital, in the narrow space between its back wall

and the scarped rock, there is a building containing benches, basins, and four baths, so small (only three feet long) that they are of no use.

This wash-house is placed where it ought not to have been built at all. It affords no better accommodation than is given to healthy soldiers in barracks, and it obstructs the ventilation of the narrow court, makes it more damp than it would otherwise be, and does injury to the lower wards on that side. It should be cleared away, as also the walls crossing the space, in order to leave as free a passage for air as possible, where it is so much wanted. There should be nothing to obstruct the air currents behind the hospital.

It will be necessary to provide each floor of the hospital with proper bath and ablution rooms communicating with the wards.

*Cook-houses.*—There are six cook-houses, one intended for the service of each regiment. They are fitted up with the usual grates, boilers, &c. The whole of them should be abolished, and one kitchen provided for the hospital. The difficulty has been to find a suitable place for it. Those in use are under sick wards, which is a most undesirable arrangement in so hot a climate as that of Gibraltar. It has been proposed to build a new kitchen on the high ground immediately behind the hospital. To this proposal we cannot assent, as besides the cost of its construction it would still further diminish the external ventilation at the back of the building; and we think the arrangement we shall propose will be suitable.

## Hospital Improvements Required.

We next proceed to consider the nature of the alterations required to convert the building into a general hospital under section VIII. of the new Medical Regulations.

*Internal Re-arrangement of Buildings.*—The present regimental arrangement has been the subject of constant complaint for some time past on the part of the Governor of Gibraltar, the principal medical officer, and the purveyor. Besides its other disadvantages it has led to a most unnecessary multiplication of offices, stores, &c., occupying space where it is most urgently required for sick and their immediate attendants. Medical officers and their families have been quartered within the building, and their servants, horses, &c. are lodged within the hospital enclosure, increasing the number of unnecessary inmates and adding to the difficulty of preserving discipline and cleanliness.

The stores within the hospital are so many sources of foul stagnant air, which ought not to exist in the immediate vicinity of sick wards, and the whole construction has been rendered needlessly complicated by the alterations necessary for introducing the regimental system.

The only way to deal with this great evil is to clear out of the building everything not required for the immediate care and treatment of the sick. All kitchens, stores, surgeries, should be removed, and all the present partitions which the introduction of these offices rendered necessary should be taken down so as to simplify the whole building and restore it to the state in which it originally was. The medical officers' quarters should be vacated, and resumed for the special service of the hospital, and suitable quarters provided for them within a convenient distance of the building.

*Cubic Space per Bed.*—Having freed the building from obstructions, a sufficient amount of space should be taken for the number of beds required for the garrison, at the usual rate of strength, and also the requisite number of beds for sailors of the Royal Navy, and for each of these beds at least 1,200 cubic feet should be set apart. Gibraltar has a climate intermediate between a temperate and a tropical one, and would strictly require a larger allowance of space than the amount stated; but the size of the hospital would not admit of the tropical allowance of 1,500 cubic feet being given. In no case, however, should less than 1,200 cubic feet be set apart for each bed.

*Ventilation.*—The best method of increasing the light and ventilation of the wards would be to enlarge the windows by extending them upwards to within a foot of the ceiling and downwards to within 2 feet 6 inches of the floor, but as this would be very expensive, we would recommend that all the first-floor wards not yet provided with roof ventilation should have louvres carried through the ridge, and that every first-floor ward should also have louvred ventilators introduced at the eaves, on each of the opposite sides of the wards, one in each wall space between the windows and between the end windows and corners. Louvres should also be carried through the ridge of each pavilion, and a louvred ventilator placed on each side of each ward in the pavilions. By these means a free current of air will be kept up in them.

The ground-floor wards require to be differently dealt with, and for these we would propose to carry two ventilating shafts, similar to those on Plan X. Fig. 2, one at each end of these wards, up through the roof of the hospital. These shafts should have an aggregate section of one square inch for every 30 cubic feet of contents in the ward, with means

of closing by valves to two-thirds of their area in cold weather. The best place for them would be in the corners. Ventilating grates should be introduced where there are fire-places. Inlets would also be required close to the ceiling, and for this purpose louvred ventilators, on each side of the ward, arranged as we have proposed for the upper-floor wards, would suffice. They should be placed at equal distances from the corners and from each other so far as the structure of the wards will admit.

The next point requiring attention is to provide sufficient accommodation in the way of dispensary, stores, and kitchen, nurses' rooms, sculleries, water-closets, baths, and ablution rooms.

*Consolidated Dispensary and Stores.*—We would propose to have only one dispensary, one common pack store having a superficial area of about 800 square feet, one bedding store with an area of 600 superficial feet, one utensil store, one clean linen store with 350 superficial feet, a foul linen store away from the sick wards, and a condemned store having 400 square feet of surface. The stores should be placed in the outbuildings, and additional space for them found by raising the one-story buildings at the south end of the hospital enclosure, if necessary.

The purveyors' issuing stores should be placed near the proposed kitchen wherever convenient space could be found for them.

*Nurses' Rooms and Sculleries.*—For all the wards in the front of the building, nurses' rooms and sculleries can be found immediately outside the ward doors, in rooms used as stores, surgeries, &c. For the wards at the back of the hospital, nurses' rooms and sculleries can be arranged in the corner pavilions. The scullery should have a small glazed earthenware sink for washing teacups, &c., together with the means of keeping these vessels. The sink should be well trapped, and supplied with hot and cold water. The scullery should be well ventilated by a shaft through the roof and by an inlet direct from the outer air.

*Water-closets and Ablution and Bath Rooms.*—At each end of the main building and on each floor there should be placed in a detached well-ventilated addition three water closets on Jennings' principle and a water-closet sink. In another division of the same added building there should be three white earthenware ablution basins, let into plain slate slabs and a fire-clay bath. *See* Plans XV. and XVI. The sink, basins, and bath should have hot and cold water laid on. For the wards at the back of the hospital similar accommodation should be provided at each end. Access should be obtained to these conveniences by a corridor open to the air in warm weather, but capable of being protected by windows in the cold season.

*Consolidated Kitchen.*—There is a building, formerly a kitchen, now used as a purveyor's store on the north side of the hospital, on sloping ground, close to the north-east corner. This building could easily be fitted up as a hospital cook-house, and connected by a wooden gangway a few yards in length, with the first floor of the hospital, and thence by a little care in preserving the heat of the vessels, the diets could be distributed all over the building. The kitchen would require refitting with cooking apparatus: hot plate, two ovens, and four boilers. Probably a Radley's cooking apparatus, similar to the one in the Royal Military Infirmary, Dublin, or one of Benham's ranges specially constructed for the purpose would do. The building is in two floors, which should be thrown into one for greater ventilation and coolness. This plan would entail the smallest outlay of money, and the displaced store could easily be accommodated elsewhere.

*Organization of the Hospital.*—Having described the chief improvements required, we proceed to consider the question of reorganizing the hospital, and the buildings and quarters required for this purpose.

And first, we entirely concur in the opinions expressed by all parties as to the necessity of putting an end to the present system of regimental administration. It is inefficient, costly, and injurious to the sanitary condition of the hospital. We would, therefore, consolidate all the stores and offices, and remove all persons not immediately necessary for general hospital administration out of the hospital precincts. This being done, we propose to provide for administering the hospital as a general hospital, in terms of the 8th section of the new Medical Regulations.

We have consulted with the Director-General and Purveyor-in-Chief on the subject and as to the accommodation necessary for each class of officers to comply with the regulation, and the requirements are as follow:—

1. The Director-General states that the principal medical officer at Gibraltar is too much occupied with his duties to undertake the management of a general hospital, and that it is necessary to appoint a commandant, with an office and quarters within the hospital precincts, together with a quarter for his clerk.

2. The principal medical officer has a house in town but he will require an office, together with a quarter and office for his clerk, and a quarter and office for the registrar.

3. Orderly medical officer with quarter within the hospital precincts.
4. Dispenser with quarter within the hospital precincts.
5. Purveyor, and a clerk, with quarters, and office.
6. Paymaster and clerk with quarters and office.

The quarters of purveyor and paymaster may be outside the hospital precincts.

7. Captain of orderlies with quarter and office within the hospital precincts.
8. Quarters for non-commissioned officers and men of the army hospital corps.

The following quarters will be required for the medical branch of the army hospital corps:—

1 Serjeant-major, 8 serjeants, and 30 orderlies (privates).

The orderlies' rooms to be attached to the wards would each count as one quarter.

For the purveying branch of the corps quarters will be required for—

1 Serjeant-major, 2 serjeants, 1 lance serjeant, and 5 privates.

Quarters will be required for surgeons who cannot be conveniently quartered with their regiments, each quarter consisting of two rooms and kitchen with accommodation for their servants in common, and also stable accommodation, all outside the hospital precincts.

The orderlies should have a light, airy, well-ventilated sleeping room, with opposite windows, the beds between the windows, shafts for the removal of foul air and inlets for admitting fresh air. There should be an allowance of 600 cubic feet each man at the least. They also require a room for dining, which might be placed near the kitchen.

Each ward master or assistant ward master must be quartered so as to have entire command of the division of the hospital of which he has charge. Probably one ward master's or assistant ward master's quarter would be required for each floor of each side of the hospital square on which there are sick. He might occupy one of the rooms attached to a ward.

There should be a waiting room together with a reception room for patients, the latter supplied with a bath for cleansing the men before admission to the wards. These could conveniently be placed in a one-story building near the lodge.

It would be of great importance in such a place as Gibraltar to appoint female nurses as soon as the experience at Woolwich has been sufficient to warrant this step; and if this were done, quarters could be found for the nurses in the existing buildings.

These proposed arrangements must of course be subject to careful local investigation, and possibly some of them would have to be modified; but it appears to us to be unadvisable to erect more additional buildings than can possibly be avoided, partly on account of the hospital itself and partly from the nature of the tenure on which it is held from the Admiralty.

There is no accommodation for the sick wives and children of married non-commissioned officers and soldiers; and nothing satisfactory can be done in the way of providing this accommodation until the question of married quarters is settled. At present the married people live all over the garrison from the Neutral Ground to Europa point, and one hospital establishment would not be sufficient for them. When quarters are provided probably two or three rooms at the most convenient points for access from or attached to the quarters of each district for lying-in women and sick children would best meet the case.

A reference to the annexed plans of the hospital, Nos. XXV. and XXVI., showing its present state and the proposed changes, will enable a clearer idea to be formed of the nature of the alterations we have recommended.

1. We propose that all the temporary cross partitions dividing the wards on the ground floor, at present occupied as stores, kitchens, &c., be removed, to throw the wards open from end to end, so that they shall correspond to the wards over them. All temporary partitions in the upper floor wards to be likewise removed. The whole of the space so reclaimed to be rendered fit for the reception of sick, and the ground floors to be boarded, with ventilation beneath them.

We propose to provide the administrative offices as follows (the references are to be altered plan, No. XXVI.):—

2. The pavilion F, F, at the entrance gate of the enclosure, to be set apart for the commandant's quarter.

3. The ground floor I, I, of the south-west pavilion to be for the orderly medical officers' quarters.

4. The two upper floors *i*, *i*, of the same pavilion to be for the captain of orderlies' quarters.

5. The north-west pavilion G, H, *h*, *h*, *q*, *q*, we intend for a quarter for the superintendent of nurses, for the clean linen store, mending room, and nurses' quarters. Water-closets will have to be provided for all these quarters.

6. The purveyor's quarter to be at *m*, *m*, and the purveyor's stores removed out of the hospital, to be placed in an additional story added to the existing stores *a*, *a*. The issuing stores to be at K, on the site of one of the kitchens.

7. A new dispensary with dispenser's quarters will have to be built at X, Y, *o*, *o*.

8. A new block of one-story buildings will also require to be built at the west side of the entrance gate (Q, R, S, T, U, V,) for waiting room, surgery, registry, and principal medical officer's office. The offices for the commandant, purveyor, and captain of orderlies are at N and O, under the purveyor's quarter.

9. We propose to remove the stables out of the buildings they occupy at present, and to convert them into a fuel store Z, and a foul linen store *f*.

10. The kitchens removed from within the hospital we propose to consolidate in one kitchen at L, and to make the building there suitable for this purpose by throwing the two floors of the building together to obtain more height and ventilation.

11. From this kitchen the diets will be carried by a gangway at *s* to the first floor of the hospital.

12. The ward nurses' rooms and sculleries we propose to obtain as follows:—The rooms A, A, on each side the central entrance and staircase to be used for wardmasters or nurses. The rooms A, A, on each floor of the back pavilions to be set apart for the same purpose. The rooms B, B, attached to these nurses' rooms to be for sculleries.

13. The orderlies to be accommodated in the upper floors *p*, *p*, of the pavilions at the back of the hospital. The orderlies' dining room to be at *k*, over the purveyor's issuing store.

14. Waterclosets, baths, and ablution rooms may be most conveniently placed as follows:—

Behind the front line of buildings at each end there is a small court containing some useless constructions. We propose to remove these and to throw the courts open for ventilation. In doing this sufficient space can be obtained for waterclosets and baths, and as they will be reached from the wards by outside verandahs, they will be completely cut off from the wards. For the back line of wards, waterclosets and baths will have to be constructed at one end in a small court, and at the other end in a small building projecting beyond the line of the hospital. The positions in which we propose to place these are shown at E, E, E, E, on the altered plan.

With these re-arrangements and trifling additions this hospital will be greatly improved, both in its sanitary condition and in its facilities for administration and discipline.

### References to the Plans of the Naval Hospital, Gibraltar.

Plan No. XXV., Present Accommodation.

A. Officers' quarters.
B. Serjeants' quarters.
C. Surgeries.
D. Purveyor's stores.
E. Cook-houses.
F. Servants' rooms.
G. Purveyor's quarters.
H. Officers' kitchens.
I. Prisoners' ward.
J. Pack stores.
K. Stores.
L. Stables.
M. Apothecary's store.
N. Dead house.
O. Guard house.
P. Ablution house.
Q. Bath room.
R. Lodge.
S. Men's latrines.
T. Sergeants' do.
U. Waiting room.
V. Women's waterclosets.
W. Naval officers' quarters.
X. Purveyor's office.
Y. Orderlies.
Z. Dispensary.

Plan No. XXVI., Proposed Accommodation.

A. Nurses' rooms.
B. Sculleries.
C. Serjeants' quarters.
D. Serjeant-majors' do.
E. Baths, waterclosets, and lavatories.
F. Commandant's quarter and kitchen.
G. Mending room.
H. Clean linen store.
I. Orderly medical officer and servant.
J. Women's waterclosets.
K. Purveyor's store (issuing).
L. Cook-house.
M. Purveyor's kitchen.
N. Purveyor's office.
O. Commandant's and captain of orderlies' office.
P. Lodge.
Q. Waiting room.
R. Surgery.
S. Bath room.
T. Clerk to principal medical officer.
U. Principal medical officer.
V. Registry.
W. Guard house.
X. Dispensary.
Y. Dispenser's kitchen.
Z. Fuel store.
*a*. Purveyor's stores.
*b*. Apothecary's stores.
*c*. Men's latrines.
*d*. Orderlies' latrines.
*e*. Serjeants' do.
*f*. Foul linen store.
*g*. Servant.
*h*. Superintendent of nurses and kitchen.
*i*. Captain of orderlies.
*k*. Orderlies' dining room.
*l*. Purveyor's servant.
*m*. Purveyor's quarters.
*n*. Purveyor's watercloset.
*o*. Dispenser's quarters.
*p*. Orderlies.
*q*. Nurses.
*r*. Ward for naval sick officers.

The numbers refer to the wards.

# PART III.—BARRACKS AND HOSPITALS IN MALTA AND GOZO.

We propose in this part of the report to give, first, a general account of the topography, climate, and diseases of Malta, together with a statement of the diseases incident to troops serving on the station.

We shall then give a general description of the present barrack and hospital accommodation, its sanitary condition, and the nature of the improvements we propose should be carried out; and lastly we shall give the details regarding each barrack and hospital separately.

## SECTION I.—SANITARY CONDITION OF THE ISLANDS.

The Malta command consists of a group of small islands, extending from N.W. to S.E., in a line about 27 miles in length. They are situated about 70 miles from the most southern point of Sicily, and about 200 miles from the nearest point of the African continent. Their approximate latitude is 35° 53′ 49″ N., and their longitude 14° 30′ 28″ E. The most northern of the group is the island of Gozo, which is separated from Malta by a channel three miles in breadth, with the small island of Comino lying about midway in the channel. There is accommodation for troops on both the larger islands; and we shall consider their general topographical features, climates, and diseases together.

### 1.—Topography of Malta.

This island is 17 miles in length, by 8 miles in its greatest breadth. It is of an irregular oval form, deeply indented with bays along its northern aspect. The land generally rises by a rapid slope from the sea, and along a considerable part of the coast it is rocky and precipitous.

The interior of the island is undulating and hilly. The highest ground is on the south side of the island, and consists of a range of rocky heights, with ravines descending from them.

There are several parallel chains of hills running from W.N.W. to W.S.W., right across the island. They are generally from 500 to 600 feet in height, but the Bingemma hills, 9 miles west from Valetta, attain a height, at their highest point, of 829 feet above the level of the sea.

There is more or less of table-land on the summits of the highest ridges, and the descent to the valleys is often very steep.

The approximate superficial area of the island may be stated at 100 square miles, divided into several natural drainage areas by the configuration of the ground. The N.W. extremity of the island is drained to the sea by a number of ravines. The S.E. extremity is drained by valleys. The whole of the central part of the island, amounting to about half of its entire area, has its natural outlet for drainage towards the harbours of Valetta. Most of this area drains into a valley, in which the village of Curmi is situated, above the head of the Great harbour. This valley is the lowest ground in the island; part of it indeed was formerly a marsh, gained from the sea, and is about to be restored to it in the shape of a great commercial port, which, when completed, will be one of the most important public works in the island.

While the marshy ground existed the vicinity of it was dangerous to health, so much so that the village or Casal Paola, situated on the slope of a hill half a mile to the S.W. of it, became uninhabitable from fevers, and was deserted by the people.

There is neither lake nor river in the island; but during the season of the rains some of the dry ravines become converted into deep and rapid streams for a short time. Most of the rain-fall however is absorbed by the very porous subsoil.

The geological structure of the island, as determined by the survey of the Earl of Ducie and Capt. A. B. Spratt, R.N. appears to belong to the tertiary series. The

lowest rock is a hard semi-crystalline limestone, occurring at various points along the coast, and also in the interior of the island, particularly along a great fault which traverses the island from east to west. Above this is a series of soft porous sandstones of different shades of colour, yellow, reddish and white, which furnish the Maltese building and filtering stones. They are easily worked, not persistent in the air, and they absorb a large quantity of water during rain. All the permanent barrack and hospital accommodation in the island is constructed of these sandstones. They form the surface of three-fourths of the area of the island, covering the middle and eastern districts.

There is no other formation above them until we arrive at the hilly western end of the island, where we find the sandstones underlying beds of marl and coloured sands, over which, and covering all the higher ground, are beds of coral limestone. The great fault, already mentioned, has been occasioned by a change of level of the eastern extremity of the island for many yards, by which the coral limestone, the highest member of the series, has been made almost conformable with the crystalline limestone, which is the lowest. The only deposit of alluvium in the island is found in the valleys, principally in those at the western end. Everywhere else, with the exception of a patch here and there, or where the people have carried alluvium to cover the surface, there is nothing but bare, barren rock, of a pale yellowish colour. From the absence of water and soil there are very few trees, and such as exist are chiefly confined to private fields and gardens. There are no hedges, only uncemented stone walls; and no shade from the hot scorching sun, and the bright light reflected from the ground and walls. The general aspect of the island is barren; but the people are very industrious; and by hard labour in breaking up the surface, carrying soil from places where it can be obtained, sea-weed and other matters for manure, and by watering the plants, the island is more productive and richer in agricultural produce than its barren aspect would indicate.

The great improvement required everywhere, but particularly in the vicinity of the barracks, is shade from trees. This can only be obtained at considerable labour and cost, for the reasons mentioned; a good beginning has, however, been made in the botanic garden at Floriana, and also by the present Governor, Sir J. Gaspard le Marchant, who has very successfully planted several squares in Valetta with beautiful trees, among which are fine specimens of the *Wellingtonia gigantea*, perhaps the largest in this hemisphere.

There is nothing in the general features of the island to render the atmosphere unhealthy, or to give rise to particular diseases, although from the soft porous nature of the building stone it is liable to retain damp, both in the foundations of houses and in walls and roofs constructed of it. The chief causes of disease must, therefore, be sought for either in special localities or in sanitary defects, unwholesome habits, &c.

The population is chiefly aggregated in the series of towns of which Valetta is the centre. The remainder is in large villages scattered over the country. With the exception of one or two small forts, and the new barrack at San Giorgio, the garrison of the island is quartered in immediate proximity to the towns of Valetta, Vittoriosa, Senglea, and Cospicua, which are all within the lines, Plan XXVII.

Valetta, and its suburb Floriana are situated on the north-east side of the island, and occupy part of a long tongue or peninsula of rock nearly two miles in length by half a mile in breadth, lying from S.W. to N.E. between the two principal harbours of Malta. The Great harbour bounds the peninsula along its whole length on the S.E., and Marsa Muscetto, or the Quarantine harbour, bounds it on the N.W. The extreme point of the peninsula on which Fort St. Elmo is situated projects into the open sea between the mouths of the two harbours. It is about 50 feet above the water level, and from Fort St. Elmo the ground continues to rise until it attains a height of about 170 feet at the bastions on the land side of the town. As seen from the harbours Valetta rises boldly out of the water, and is well exposed to the sea breezes.

In the same manner as Valetta projects between the two harbours, there are long narrow tongues of rock projecting into each of the harbours, leaving creeks between them. There are five of these projecting tongues in the Great harbour. On the outer one, next the open sea, Fort Ricasoli is situated. The next is occupied by the great naval hospital. The third is covered by Citta Vittoriosa, with the town of Cospicua on the land side of it, and Fort St. Angelo at its point, opposite the entrance to the Great harbour, at about a third of its length from the sea. The fourth peninsula is long and narrow, and is covered by the town of Senglea. These towns are all strongly fortified, and lie within the Cotonera lines. The dockyard creek lies between Senglea and Vittoriosa. Near the top of the harbour, beyond Senglea, are the Corradino heights, which project between French creek and the upper end of the harbour; they are not

built on. These projecting points of land are all of sandstone rock, and rise boldly out of the water, but to a less elevation than Valetta.

There are four projecting points of land in the Quarantine harbour. The outermost of these next the sea is occupied by Fort Tignè. The next is an island connected with the land by a short bridge. Fort Manoel and the Quarantine establishment are built on it.

Near the head of the harbour are two other tongues of land, Misida or Tascibiesc and Pieta, not used for military purposes. All of these projections are also of sandstone, and rise to some height out of the water, but all are overlooked by Valetta.

The foreshores towards the sea are of rock. They are the same in the harbours, with the exception of the marshy ground at the upper end of the Great harbour, now being excavated for a commercial dock. The upper ends of one or two of the creeks are liable to deposit of decaying matter floated into them. There is also some low ground on the west side of the Quarantine harbour, not very well drained, but it is at a considerable distance from the town.

The Mediterranean being a tideless sea, the water in all the harbours is more or less stagnant, and this is the cause of very serious nuisance, not so much from the fact of stagnation itself, as from its effects on the sewage of the town, and on other putrescent refuse discharged into both harbours. From the want of rapid circulation of water, considerable areas of the surface become charged with offensive matters, the smell from which extends into the towns and even into certain of the barracks.

The same defect exists in all the Mediterranean ports, and in Malta, perhaps, less than in others, on account of the larger body of water in the harbours. We shall revert to this subject further on.

### 2.—Topography of Gozo.

Not much requires to be said as regards Gozo. Its general features resemble those of the western extremity of Malta, except that there are a larger number of isolated hills, apparently the result of extensive denudation. The lowest rock is semi-crystalline limestone, over which are sandstones, marls, and coral limestone, as in the Malta series. The small island of Comino appears to consist entirely of coral limestone. The marls cover a much larger surface in Gozo, and the island generally has a much greater appearance of fertility than Malta. There are also more trees on it, and deeper soil.

The castle of Rabato, which contains some accommodation for artillery, is situated on one of the lofty isolated hills alluded to, in the centre of the island.

Fort Chambray, which contains most of the barrack accommodation, is on a bold headland on the S.E. of the island, opposite Malta.

There are no sources of local unhealthiness in the position either of Rabato or Chambray; both are on lofty eminences, and Chambray is exposed to the sea breeze.

All the permanent barracks in Malta are built on the porous sandstone rock, and those in Gozo are on the coral limestone.

From the very soft character of the sandstone its surface is so easily ground to powder that the least breath of wind during the dry season fills the air with dust, which, together with the dry hot state of the atmosphere and the glare from reflected sunlight, is considered to be a cause of ophthalmia among the troops.

### 3.—Climate.

For a number of years past there has been a meteorological observatory in Valetta, at which observations have been kept by officers of the Royal Engineers. In the Appendix (Nos. 1 and 2) we have given an abstract of these for two years, 1859 and 1860, which are sufficient to give a general idea of the climatic peculiarities. Taken as a whole, the climate is not one of extremes. The mean variation of temperature between morning and afternoon is hardly more than a degree or two. Between day and night the average highest and lowest temperature varies from 8 to 10 degrees in winter, and from 10 to 15 degrees in summer. The mean maximum temperature of the hottest months varies from 73° to about 88°; and the mean minimum of the hottest months varies from about 60° to 73°. The mean maximum of the coldest months varies from about 58° to 64°, and the mean minimum from about 49° to 54°. The highest temperature of the hottest months has varied from 87° to 101°; and the lowest of the colder months from about 39° to 47°. The highest observed temperature in the shade has been 101° in summer, and in winter 75°. The sun temperature has been observed as high as 120°. The lowest observed temperature on any day in summer has been 53°, and in winter 39°. The extreme monthly range of temperature in the most variable months has been 32° in summer and 28° in winter. The mean humidity of the air varies from about $\frac{7}{10}$ths to $\frac{8}{10}$ths of the quantity required for saturation.

The late autumn, winter, and early spring are the periods of rain. The rains usually begin in October, in which month about 1½ to 2 inches fall—most of it in a day or two. In November the amount varies in different years from less than 2 to 6, 9, or 10 inches, from a third to a half of which has been observed to fall in one day. The fall in December diminishes, and in January or February together the fall is about 2½ to 9 inches. In both months the greater part of the rain falls in two or three days. The total rain-fall varies considerably in different years.

Winds blow from the NW., N., and NE. for about three-fifths of the year; S. and SE. winds prevail for about a fifth; and the remaining fifth is made up of SW., W., and E. winds, chiefly the first.

The climate is simply the result of insular position and temperature. Like all places in the Mediterranean, Malta is exposed to the sirocco winds, which, whenever they prevail, lower the standard of health for the time. They blow from 60 to 80 days a year, and produce languor, lassitude, and disinclination for exertion. The sick and persons in feeble health suffer from them, especially in situations directly exposed to their influence. The sun's rays are very powerful during summer, partly on account of the transparency of the atmosphere, and everything is scorched and dried up by them.

As a whole, Malta enjoys a fine climate, especially in winter and spring, during which seasons the heat is temperate and the climate very healthy. A rise in temperature is attended by a lower standard of health; and when the mean air temperature reaches 70° F., which it does early in June, sickness begins to increase gradually. July, August, and September are the most unhealthy months. The mean air temperature falls below 70° F. early in October, the increase of sickness disappears, and the remainder of the year is healthy.

Small as the island is, it has local climates differing materially from each other. The observations kept by the Royal Engineers give the climate at Valetta; but the observations do not represent the climate on the hills at the western extremity of the island. There are, it is true, no observations to show in what the difference consists, but there is no doubt that at Città Vecchia, and indeed along the ridge extending to the south from it at elevations of 600 to 750 feet, the temperature is lower and the air keener and more bracing than it is lower down. So much is this the case, that during summer the feeling in going from Valetta to the hills is like that produced by going into a colder climate, and the atmosphere is on this account found not to be suitable for chest diseases. There are excellent local sea-shore climates, such as that at Sliema, to the NW. of Valetta, which afford a ready relief during summer from the hot close streets of Valetta.

It will be seen that there is nothing in the general topography or climate of Malta directly productive of disease. Like every other climate this has its inconveniences; and, like other climates of high average temperature, it exercises a certain debilitating influence on the natives of colder latitudes; but, besides this its nature is such as to add intensity to the effects of local causes of disease and to the consequences of intemperate habits, and all local causes and personal habits are of much greater importance in warm than in cold climates, especially as regards their influence on the frequency and intensity of epidemics.

### 4.—Mortality and Diseases of Native Population.

We next proceed to state what are the prevailing diseases among the native population, and to compare them with those which prevail among the troops in garrison.

With this view we have obtained the police mortality returns among the native population for three years for all the town and country districts, and also the admissions and deaths for three years in the civil hospital, at Floriana, abstracts of which are given in the Appendix (Tables, 3, 4, 5, 6).

We have retained the diverse nomenclatures and classifications of the returns, in order to show the necessity for assimilating both to those recommended by the International Statistical Congress, and used by the Registrar-General of England. We were informed by the Hon. Mr. Inglott, comptroller of charitable institutions, that he considered it indispensable that this should be done, and that he was endeavouring to introduce the reform into the institutions under his control. The police statistics must also be brought under the same system before reliable data can be obtained to show the state of the public health. And one form of return should be made use of. As a proof of the necessity of the change proposed it will be observed that the hospital forms recognize "diarrhœa" and "dysentery" as having occasioned 84 deaths in three years in hospital; while the police returns take no notice whatever of these diseases. They are apparently included under the names "gastritis" and "enteritis" by the police registration; and as a consequence the returns are useless for ascertaining the sanitary state of the population at any given time.

The only means at our disposal for comparing the mortality with the population is derived from the census of 1851, and as the population has increased since that period,

the death rate given by the police returns, ought to be less than it is, but even supposing that no increase of population has taken place, the death rate is very low for the towns and very high for the country districts exhibiting in both cases an anomaly which we have no means of accounting for excepting on the supposition that the system of registration is not such as to afford reliable results.

For example, the census of 1851 gave for the whole island a *native* population of 98,021. Of these 52,169 were located in the five towns within the garrison, and 45,852 occupied country districts, mostly in large villages.* Taken on this population, the police returns for the years 1859–60–61, would give an average death rate, for the towns, of 21·3 per 1,000 per annum, and for the country of 28·7 per 1,000, a difference so very striking as to demand further inquiry to say the least of it. Another singular circumstance is that nearly 57½ per cent. of the mortality is returned among children under five years of age, a rate far exceeding that of the most unhealthy large towns in England.

The mortality of the towns within the garrison from these, the only available data, is as follows:—

| Towns. | Population, 1851. | Mortality per 1,000 per Annum (1859–60–61). |
|---|---|---|
| Valetta | 23,627 | 21·6 |
| Floriana | 6,504 | 15·8 |
| Senglea | 5,952 | 20·6 |
| Cospicua | 10,576 | 24·1 |
| Vittoriosa | 5,510 | 22·3 |

The anomaly in this case is that while the towns in their unimproved state show a comparatively low mortality, the proportionate difference between them individually is far more in accordance with their respective sanitary condition, than is the difference between their collective death rate and that of the country districts, when compared with the respective advantages of town and country as regards health.

An examination of the causes of mortality presents some rather unexpected results. Periodic fevers are extremely common along the shores of the Mediterranean, and yet during these three years the police returns contain not one death from either remittent or intermittent fevers. Indeed the printed form in use has no headings for periodic fevers. The hospital form, on the other hand, has a heading for intermittent fever, but none for remittent, and a reference to it will show that in the same three years there were 25 cases, and 2 deaths from intermittent fever among natives admitted to the civil hospital. It is worthy of remark that the police returns take no notice of these 2 deaths. The following abstract shows the chief groups of diseases to which the mortality in the police returns is attributed:—

| Diseases. | Total Mortality, 1859-60–61. | |
|---|---|---|
| | Town. | Country. |
| Fevers, nervous, typhus | 132 | 91 |
| Small-pox | 196 | 130 |
| Whooping Cough | 45 | 69 |
| Croup | 47 | 35 |
| Measles | 47 | 61 |
| Teething | 741 | 820 |
| Convulsions | 153 | 327 |
| Scrofula | 13 | 18 |
| Phthisis | 156 | 71 |
| Atrophia Mesenterica | 170 | 297 |
| Total | 1,700 | 1,919 |
| Mortality from all other diseases | 1,644 | 1,906 |

Here we have certain groups of diseases which are known to be connected with foul air in dwelling houses, arising from filth, bad drainage, overcrowding, bad ventilation, and general defective management of children, occasioning one half of the entire mortality of

* Table No. 5 (Appendix) gives an abstract of the *total* population of Malta and Gozo from the Census of 1851.

the island. If to these we were to add the annual deaths from dysentery and diarrhœa, neither of which diseases, although common enough, figure in the police returns (unless they are placed under "gastritis," and "enteritis"), and an indefinite disease which causes a large amount of mortality under the name of "debility," we should have a very large death rate from mitigable and preventible disease.

The hospital statistics show that during the three years under consideration, there were 195 natives admitted for diarrhœa and dysentery, of whom 68 died.

The hospital table gives the nature of the fevers admitted according to the nomenclature in use. The most common forms are continued, intermittent, and typhoid, the first occasioning the largest amount of mortality. The most frequent of the fatal forms of fever in the police returns are all included under the generic name "nervous fever" and "typhus." Distinctly marked remittent fever appears to be of unfrequent occurrence.

There is another disease called "anthrax," "carbuncle," "phlegmon," "boil," "pustule," not uncommon at Malta, as in other Mediterranean cities, which is of great importance on account of its supposed relation to plague.

Dr. Burrell, in his report on the plague of 1813,* has shown that in 23 years preceding 1843 nearly a tenth part of the admissions into the civil hospital at Floriana were of this disease. The deaths were about one in 60 of the cases.

In 1846 there were 22 deaths from boil, and 121 deaths from fever, and since then anthrax has afforded a mortality of from four to eight or ten a year. In the years 1850, 1851, and 1852, 684 cases of anthrax were treated in the dispensaries of Malta and Gozo, of which 15 died; a mortality of one in 45 cases. The disease usually shows itself in the form of tumours at the lower part of the neck, between the shoulders, or in the loins. They are said to vary in size from that of a pigeon's egg to a circumference of eight inches. They are preceded by shivering, head-ache, prostration, sickness, occasional vomiting and sleeplessness, succeeded by fever, the appearance of the carbuncle, and slight typhoid symptoms. A large proportion of the cases are very trifling in character, but in particular years the disease is more severe; it yields a higher mortality, and the cases are of protracted duration.

In the years 1859–60–61 there were 142 cases of this affection admitted into the civil hospital, Floriana, of which 10 proved fatal. The police returns for the same years give 38 deaths for the whole island from this disease, and also 223 deaths from nervous or typhus fever.

Anthrax and its allied diseases are more common in summer than in winter, and among males than females. Its subjects are generally persons of sickly appearance, but of gross habit, living in damp, filthy localities, where the plague formerly committed its ravages.

Malta has suffered considerably from two other epidemic diseases, cholera and small-pox. The former disease first appeared in the island in 1837, and cut off 3,783 of the civil population. This large mortality shows a high degree of susceptibility to epidemic disease.

Small-pox also prevails to a considerable extent occasionally, although compulsory vaccination has been in use for seven years, as shown by the Ordnance, Appendix Nos. 9 and 10. This disease existed in its epidemic form while we were in Malta, and had cut off 150 children in 7½ months, as shown in Appendix 11. It occurred chiefly in the usual epidemic localities, abounding in local causes of disease. Sanitary improvement and a more extended use of vaccination, are absolutely necessary to diminish the frequency of this scourge. Rheumatism is also a common disease, affording about 120 annual admissions to the civil hospital.

The most important feature in the sanitary history of Malta is the occurrence of plague epidemics, of which five are on record, those of 1592–3, 1623, 1655, 1675–6, and 1813. During the first visitation 3,800 persons died. There were only 20 deaths in 1655. The most severe visitation was that of 1675–6 during which 8,596 persons died, out of a population of 60,000. In 1813, out of a population of 92,000, 4,440 died of the pestilence.

This last epidemic was preceded by plague at Constantinople, Smyrna, and Cyprus, in the year 1812. In this year also yellow fever broke out in Spain. In January 1813 plague occurred at Alexandria. In June and July of the same year, while plague existed at Malta, there was yellow fever at Gibraltar; the facts all proving that an epidemic influence prevailed over a large area of the earth's surface.

The Malta epidemic of 1813 might have been the best observed on record, but unfortunately so much time and attention were bestowed on discussions about contagion and quarantine, that many of the most essential points in its history were lost; and it was only by inquiries carried out by Dr. Burrell nearly forty years afterwards that anything

* Appendix V. to the Second Report on Quarantine of the General Board of Health, 1854.

like a sanitary account of the epidemic was rescued from oblivion. Like all epidemics it began slowly and without attracting notice. Detached cases of doubtful character occurred at the end of March and beginning of April. The first recognized case occurred on the 14th April and died on the 19th. On the 5th May there were no known cases of the disease, and it was not till the 19th May that the epidemic showed itself. After that date it followed the usual epidemic law of increase and decline, and finally disappeared in the spring of 1814.

By the time the presence of the disease was fully recognized there was little hope of benefit from any measures of hygiène. But everything that could be done to aggravate the pestilence by the most absurd and destructive internal quarantine was certainly accomplished, with the result, as shown by Dr. Burrell's inquiry, that while, on the one hand, in six places containing 44,247 inhabitants, subject to the most refined system of restriction ingenuity could devise, 4,221 persons perished; on the other hand, among a population of 47,654 persons living in 16 infected places, where quarantine was lax or non-existent, there were only 219 deaths.

It is not likely that anything so absurd should be again countenanced as forbidding people under pain of death to leave their dark foul cellar dwellings during a pestilence, in order to obtain a breath of fresh air in the country; or that an entire population should be walled in with double walls and cordons of troops, while the only chance of safety consisted in their escaping from their houses into the fields: but the experience is too important to pass without notice, and it ought to be held up as a warning for the future.

We shall presently show how the pestilence, or at least the causes which determined its outbreak, were unconsciously allowed to grow up in the midst of the population, while the source of it was sought anywhere and everywhere except where it was to be found. The evidence, so much dwelt on at the time, for the importation of the pestilence, and for its propagation by contact, is not worth a moment's notice. But we have in the towns where it committed its ravages abundant indications, notwithstanding their comparatively improved condition, of the reason why plague appeared in them, and why the cognate diseases, carbuncle, boil, and fever, still prevail.

### 5.—Sanitary Condition of Valetta, and the other Towns within the Lines.

We next proceed to describe the sanitary condition of the towns within the garrison, beginning with Valetta.

The oldest building in Valetta is the Military General hospital, which was built in 1575 after the siege, and was the hospitium of the knights. It seems to have been the first building of any size constructed outside Fort St. Elmo. The town was subsequently extended over the crest and slopes of the peninsula it now occupies, until its further growth was stopped by the defensive works on the land side. The streets are laid out so as to cross each other at right angles, dividing the town into separate blocks, each about 100 yards in length by 50 yards in breadth. All the principal streets are open to the air, and, except in calms, there is always some circulation of air through them. There are, however, several districts of houses of a very inferior character, either surrounded by higher walls or in unhealthy localities. One of these, the Manderaggio, is built in what was once the inner harbour of Valetta, and is embedded, so to speak, among higher houses. It is the most closely and irregularly built district almost anywhere to be met with. There are no streets, only narrow tortuous alleys among lofty houses, and the place literally swarms with people. Except in this and in one or two other low districts, the general appearance of the town is fine, and contrasts favourably with other Mediterranean towns. The streets are wide and well paved, many of the houses are of very superior architecture, and the light colour of the stone gives a bright clean appearance to the town.

It is not, however, by its external appearance that the sanitary state of Valetta is to be judged. To ascertain what this really is, we must go below the surface, where we find at once certain elements of mischief connected with the local topography, drainage, and construction of the houses, which detract very much from the impression produced by external appearances.

As already stated, Valetta is built upon a peninsula of very porous rock, into which every fluid percolates almost with as much ease as into sand; and the whole subsoil, covered by houses, would in time become necessarily saturated with impurity, and a source of malaria, unless special care were taken as regards drainage. Only about a fourth part of the town occupies what may be called a flat surface, the remainder is built on very steep slopes falling from the flat part on three sides towards the sea. The tendency then of the subsoil drainage will be to gravitate towards the lower levels, on which most of the town is built; and the lowest lines of streets will be most liable to damp and malaria.

The houses along the lowest levels, including the Manderaggio, are those which are most liable to epidemic diseases among their inhabitants; and Dr. Burrell has proved by careful inquiry that they were the special seats of the plague of 1813. The pestilence appears to have burrowed among the houses on the lower levels, and to have become less and less frequent in proportion as it approached the higher levels, where the upper blocks gave one, two or three deaths, while the lower blocks gave from 10 to 20 or more deaths. In the Manderaggio, which occupies the area of two blocks, there were 85 deaths; and within a gunshot of it there are blocks of houses in which only one death occurred. But lowness of position is not the only determining cause of epidemic disease at Valetta.

*Construction of Houses.*—The defective construction of the houses, and their want of ventilation, have hitherto exercised an almost equal degree of influence on the public health, as their local position. In building a house the practice has been to dig a cellar foundation in the rock, over which the house is built. There is generally a water-tank under the cellar; sometimes the privies are there also. Any way there is a reservoir of foul air, of the existence of which anyone may be satisfied in going into the cellar, or even by passing the opening of it in the public street. With a porous subsoil, like that at Malta, the only safe way is to build above its natural level, and to leave a free ventilation between the ground and the lower floor of the house. Not only is this neglected, but even at the present time it is lawful to construct and use cellars as human dwellings; although this practice has been either abolished or very much restricted by law in the cooler climate of England.

The blocks into which the town is divided are of a very complex structure, often consisting of a number of small closed courts of lofty houses, entered by a small doorway from the street, to which the only admission of fresh air is from the top of the well formed by the houses. All the lower rooms are dark, and most of them are very imperfectly ventilated. Generally speaking, the best houses are in the wider streets at the higher end of the town, and the worst classes of dwellings are situated on the slopes and among the narrow streets near the harbours. But all over the town there is a mingling together of good and bad in the same block, and in the same street. Some of the very worst human dwellings anywhere to be seen are indeed situated immediately behind the principal streets in the higher part of the town. Generally the ground floor towards the principal streets is laid out in shops; and in the worst class of streets and courts the ground floor is used as a dwelling. It is usually arched, and sometimes a kind of floor is carried across the arch to form an additional sleeping-place for the family. Sometimes there is a hole in the floor communicating with the water-tank below, intended for the supply of the family. There are no means of ventilation except by the door and window on one side; there is nothing but the dead wall behind, sometimes formed by the rock, and no thorough draught. The poorer classes of houses are very dirty and dark, and the air in them is damp and foul. In summer these places are almost uninhabitable, and the people often sleep on the pavement outside.

Above the ground floors are the mezzanini, consisting of low-roofed rooms, often without thorough draught, badly lighted, and many of the rooms not much healthier than those in the ground floors below. The existence of back-to-back houses and shops renders house ventilation next to impossible. Every breath of air is of importance in these low, confined, overcrowded neighbourhoods; and instead of this there is stagnation at all ordinary times, and especially during the hot unhealthy periods of the year.

The worst district in Valetta is the Manderaggio already mentioned. Its peculiar structure renders it a separate town, so to speak, partly under the surrounding levels. It has no straight streets running through it. At every turning there is a cul-de-sac, and the air is always stagnant. The Manderaggio has its own peculiar group of population, and was formerly a very unsafe place to go into.

The houses in it are of the most miserable description, and are quite incapable of improvement. They are in a number of floors, reached by narrow stairs; the rooms small, dark, and noisome; and the whole place greatly overcrowded.

One of the greatest improvements in Valetta would be to pull the houses down, fill up the Manderaggio to the surrounding levels, and to build proper houses on its site.

In all the lower districts the people are sallow and sickly in appearance, and bear unmistakeable marks of the effects of impure air.

These miserable places furnish a large proportion of the cases of boil and fever occurring among the population. At the time we were there small-pox existed to a considerable extent among the people inhabiting them, and in fact they are the very places where epidemic disease would be expected to establish itself. Dr. Burrell has shown that during the plague of 1813 three times the number of ground floors and mezzanini were attacked by the disease as of the better class of houses above them.

With one or two exceptions the upper floors on the summit level of the town escaped the pestilence.

The cases on this level were confined to ground floors and mezzanini, there were none on the upper floors, and all the upper floors where the disease appeared were, with the exceptions stated, on the steep slopes leading down to the sea. It was a current remark at the time that plague was a disease that "seldom went up stairs;" and it certainly kept away from the higher, better drained, and better ventilated parts of the town, except where it found a suitable habitation in the damp, dark ground floors or unventilated mezzanini.

No one on seeing Valetta at the present day can judge of what its sanitary state was in 1813. Outwardly it is now one of the cleanest and best-kept towns in existence. It has a good sanitary police, and much has been done to improve its drainage. At the former period it was very filthy, neglected, and abounding with nuisances; but there is still enough in its present condition, and in that of the other towns, to account for the zymotic diseases which exist among the people, and to incite to vigorous prosecution of sanitary improvements. No doubt if the present enlightened course of Government be continued, the existing causes of disease will in time be removed.

In 1813 many of the better classes, from living under better sanitary conditions, escaped the epidemic, or had slight fevers which were easily arrested by removal into the country, while their neighbours perished by hundreds. Now, thanks to sanitary improvement, the worst-constructed parts of the town suffer not from plague, but from fevers and boils. It is to the extirpation of these classes of disease that future sanitary efforts must be directed; for it is unsafe to allow of their existence in the midst of a dense and increasing population in a fortified garrison town.

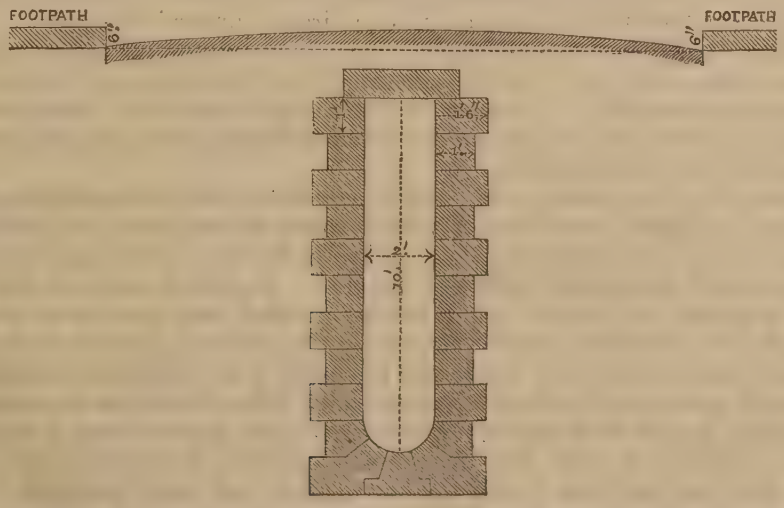
The general structure of the other towns differs from that of Valetta. Floriana is small, regularly built, and open. Vittoriosa is older and more irregular. The streets are much narrower than those of Valetta, but the area covered by the town is hardly a fourth part of the area of Valetta. Senglea is about the same size as Vittoriosa, but it is more regularly built. It consists of parallel streets, crossed by others at right angles, and every part of it is exposed to winds. Cospicua consists of narrow tortuous streets and numerous cul-de-sacs. The houses are mostly of an inferior description, and from their position they are not so freely exposed to the sea breeze as the other towns. None of these towns are so clean or well-kept as Valetta or Floriana, and we are desirous of calling the attention of the local authorities to them, as they stand in great need of thorough sanitary improvement.

We next proceed to consider the present state of the more important sanitary works.

*Drainage.*—Every street in Valetta and Floriana is drained. With very few exceptions the streets in Cospicua are also drained; but few or no public drainage works have yet been carried out in Vittoriosa or Senglea.

The extent and direction of the sewerage is shown in the Plan XXVII., and the following figure gives a section of one of the mains. The sandstone rock being very soft and easily worked, it is usual in forming a sewer to dig out a narrow trench 13 or 14 feet in depth.

FIG. 8.—SECTION OF THE PUBLIC SEWERS IN VALETTA.




This, when covered over, appears to have been the original construction of all the sewers. At present the sewer is built of sandstone blocks, and has a curved invert. The usual depth of the mains is 10 feet, and the width 2 feet.

Into these sewers is received the rain-fall during the rainy season, but none during the warmer half of the year. They also receive refuse water, and the drainage from privies in houses, &c.

There are several errors in this system of draining, which require notice. In the first place the sewers are very large, of altogether unnecessary dimensions, and quite disproportioned to the water-supply and rain-fall they have to carry away. As a result of this deposits take place, which give rise to great nuisance: because the sewers do not clear themselves, filth accumulates in them. During the dry, warm weather they become generators of foul air, and are detrimental to health.

Another important defect is the porous character of the stone of which they are constructed. This stone, wherever used for such a purpose, becomes infiltrated with sewage, and, in the course of time, the whole subsoil through which the sewers pass, becomes saturated with decomposing matter, and a source of foul air within the houses.

The stone is merely consolidated sand, and becomes infiltrated with sewage, just as if the drain were dug in sand, although of course in a less degree.

In carrying out the drainage of towns, it is absolutely necessary to provide, that when once the sewage matter has passed into the drain it shall have no opportunity of escaping into the subsoil, or of passing from the drain at all, until it arrives at the outlet. All drains should therefore be constructed of impervious material, and with closed joints. The Maltese system is opposed to this fundamental principle. Again, the section of a sewer should bear a proper relation to the quantity of water it has to remove, and also to the slope of the ground. The sections should be large enough to carry off the maximum rain-fall. The slope in the present case is so very rapid, and the distances to the sea so short, that, probably in every instance, the maximum rain-fall would pass easily through glazed earthenware pipes, laid in the bottom of the existing trenches.

Another great defect in the present drainage is the system of outlets. There are eleven of these for Valetta and Floriana, opening into the harbours. Several of them are of great size, they open above the water level, and, as they are quite unprotected, the wind blows up them into the general system of sewerage without hindrance. Attempts have been made to remedy the evil by building out the end of the sewer under the water; but such is the immense force of the sea during high winds, that the blocks of stone, of which the ends are built, are literally blown up by the impulse of the waves entering the large mouths of the outlets. This result is partly due to the circumstance that sufficient attention has not been given to the direction in which the sea advances to strike the sewer-opening, and hence the impulse is received more or less directly into the end of the sewer. Some outlets are cut out of the rock, and terminate several yards above the water level, causing nuisance by the filth being diffused more or less over the surface of the rock.

The outlets in all cases open so close to the shore, sometimes in narrow creeks, that the sewage is not diffused through a sufficient body of water to render it innocuous; and, as decomposition takes place very rapidly, there is much nuisance experienced even at some distance from the spot. Lower St. Elmo barrack suffers from this cause, and also Fort Ricasoli; but in the latter case it is the outlet of the barrack drainage which is at fault. There are three main outlet sewers close under the windows of the General Hospital, Valetta, which have been long a cause of complaint. One of the sewers passes at each end of the building to the sea, and one directly under its centre.

The obvious remedy for these defects of outlet is to terminate the sewers by iron pipes running into deep water, and properly protected from the waves, at a depth of three or four feet below the surface. The open end of the pipe should be turned away from the line of impulse of the sea, to prevent the wave dashing up the pipe and forcing the foul air back into the streets and houses.

The outlets for the sewerage at Cospicua were in a very unsatisfactory state at the time we were in Malta, on account of certain works at the dockyard having interfered with them. These outlets appear to have ended in the narrow dockyard creek, in a body of water too small to admit of sufficient dilution. In such a case as this it might be considered whether the sewage could not be divided, and part of it discharged into French creek or even Calcara creek. Anyway the present condition of the drainage in these towns would become very dangerous to health if an epidemic prevailed. A much larger body of troops are barracked in these badly drained and otherwise unhealthy towns than in Valetta, and all their sanitary works require the greatest care in execution.

*Flushing.*—We have seen that the rain-fall of Malta is confined only to the healthy months of the year, and that during the hot weather and most unhealthy months there is no rain. At the very time, therefore, when the sources of foul air should be reduced to the smallest possible extent there are no means of clearing out the deposit in the sewers carried into them from the privies and other sources of impurity. If the sewers were all relaid in the way we have suggested, and if there were sufficient water to maintain a constant current from the houses throughout the whole system of drains, no flushing would be requisite, but until combined water supply and drainage are carried into effect, a

proper flushing tank, placed at the summit level of each line of sewers, is an essential element in the drainage; and the discharge of these tanks at sufficiently short intervals, to cleanse out the whole sewerage of the town, should be as much a part of police duty as ordinary surface cleansing.

*Ventilation of Sewers.*—All the main lines of sewers should be ventilated by shafts at the highest ends, carried up at a distance from the houses; and the opening of the shaft should have a wire box fitted in it containing a foot or 18 inches of charcoal powder, to destroy the sewer gas before it passes into the external air. Care should be taken to protect the charcoal from rain, and to renew it from time to time.

*Trapping.*—All surface gratings should be carefully trapped, especially those in the courts of houses.

*House Drainage.*—House drainage appears to be carried out in some form or other pretty generally, but it is of a very bad kind. There are no proper water-closets. In the better class of houses the substitutes for them are sloping troughs of the ordinary porous stone, with a hole at the lower end covered by a rough valve, which can be lifted up by a wooden handle. Water is either supplied directly by hand, or by means of a pipe from a water-vessel filled by hand at the top of the house. The arrangement is of a very rude description, and the stone, being porous, becomes speedily saturated with filth, and a constant nuisance. It is not self-cleansing like the ordinary soil-pan.

In the poorer neighbourhoods there is a sink of the most abominable and unwholesome description generally situated in the small court close to the doors. This sink is the depository of all the filth of the houses, which is carried from each by the inmates and thrown down. Anything like a proper water supply or trapping is of course out of the question, and the arrangement is nothing but an open cesspool connected with the town sewerage. There is usually a wooden lid or cover to the sink, but it is of little or no use in protecting the health of the people from bad drainage and foul air. We found this arrangement had been introduced, by the proprietor, into one of the most recently built blocks of dwellings for the working classes, notwithstanding the great advance in improved domestic appliances which has been made of late years.

In a matter such as this, which is intimately connected with the habits and state of civilization of the people, it is of course very difficult to lay down rules; but we consider that it would be very advisable in the local authorities to introduce gradually the system of soil-pans supplied with water, instead of the present unwholesome arrangements. A few soil-pans put up here and there would gradually lead to their more extensive use, and to the final disappearance of the present most unwholesome and dangerous system. In a number of places Macfarlane's latrines might be introduced with advantage, as has been lately done at the new market, provided there were sufficient water, and the cleansing of them were confided to the sanitary police. But in the meantime, as the state of the house drainage intimately concerns the health of the garrison, it should be improved, together with the public drainage. Glazed earthenware pipes should be introduced for houses and courts in place of the sandstone drains, and the present untrapped sinks should be abolished. This is essential for protecting the public health.

*Surface Drainage.*—The rapid slopes of the towns afford every facility for surface drainage. The paving generally is very good. In all close courts, however, it would be better to pave with hard in place of soft stone, as the former absorbs less water and is more easily cleansed.

*Cleansing.*—Valetta is now one of the cleanest towns anywhere to be met with. Of late years a much better system of police has been introduced, and the cleansing is well organized. Among such a crowded population the only safety consists in removing out of the town at once and without delay the whole refuse, whether of public streets, or of courts, or of houses, so that no accumulation or nuisance whatever should be possible. This is what the present police system professes to do.

The other towns are not so clean as Valetta, and they require to be placed under the same rigid system. The population is more crowded together, both in streets and houses, and many of the houses are of a very inferior character; circumstances which render it necessary to exercise the greatest care as regards cleansing.

There is one point in which greater vigour might be exercised with advantage to the public health, and that is in the cleansing, scraping, and lime-washing of the inner walls and ceilings of the poorer class of houses. This is one of the most important measures for preventing epidemic disease which can be adopted. These houses, in the course of time, get saturated with impurities, and all the walls, ceilings, and floors should have the surface removed and lime-wash applied to purify the stone. Lime-washing should be done once or twice a year, or whenever necessary, and the surface scraped at longer intervals.

There is power to lime-wash under the laws and regulations of the police. Quicklime

should always be used for the purpose; and wherever there is fever, diarrhœa, small-pox, boils, carbuncle, or other similar diseases, the lime-washer should be set to work.

Generally in regard to the houses of the working classes, periodical inspection by a medical officer of health would prevent much sickness. This duty might in the meantime be devolved on the police physicians, who should be required to report, not only the existence of zymotic diseases, such as fevers, boils, small-pox, bowel complaints, &c., but also the local causes to which they are to be attributed, and the nature of the preventive measures required. All bad, close, musty smell indicates danger to health, and especially in such a place as Malta. These odours should be traced to their source, and their cause rooted out. Better drainage and house cleanliness, more water, with less overcrowding and more ventilation, would make a great difference in the present sanitary state of the population.

*Nuisances.*—The chief sources of nuisance are the sewer outlets already referred to and the public slaughtering-places at the head of the Great harbour, and at French creek. All the drainage from these establishments, and also from the adjacent commissariat slaughter-house, runs directly into the harbour; and, although it mixes with a considerable body of water, the water is stagnant, and the rapid decomposition which ensues occasions intolerable nuisance. Fortunately, there is no population near enough to suffer injury; but it is most objectionable to contaminate the water where there is no current to carry off the cause of nuisance.

We would advise the whole three establishments to be removed to a locality where the drainage could be utilized for manure, or where it would pass at once into moving water. This we understand is in contemplation for the commissariat slaughtering-place; the public establishments should be removed at the same time. These last were by no means sufficiently clean when we saw them, and require stricter regulation and supervision.

The provisions of the existing police law in regard to nuisances, &c., will be found in Appendix 8.

*Water-supply.*—The water-supply of the garrison and civil population is derived from rain-fall and springs. One set of springs, 10 in number, are conducted by the Wignancourt aqueduct a distance of about eight miles from the slope of the Bingemma hills. The aqueduct is carried on arches for a considerable part of the distance, and affords a supply to the population at various points along its course. The total yield of the springs in the dry season is about 537,000 gallons a day. About 200,000 gallons are drawn along the line of the aqueduct, and the remainder is distributed to public fountains, quarters, barracks, hospitals, and private tanks in Valetta and Floriana.

There is another aqueduct, called the "Fauara," which partially supplies the cities and barracks on the opposite side of the Great harbour. It derives its water from three springs yielding 92,000 gallons a day.

The other source of water is the rain-fall during the rainy season, which is collected from the roofs of houses, barracks, &c., and is stored in underground tanks. These tanks are also supplied from the aqueducts when the rain-water falls short.

We have given in Appendix No. 7. a return, furnished to us by the local government, of all the water sources and of the tanks, with their dimensions, which shows that within the lines there are 122 public tanks, with a capacity of nearly 30 millions of gallons.

In public institutions, barracks, &c., there are 152 tanks, with a capacity of about 25¾ millions of gallons.

In private houses there are 4,294 tanks, capable of holding about 323 millions of gallons.

The water-supply is hence stored up among the people. It is one of the necessities of the case that it should be so, because in the event of a siege the aqueducts would be destroyed, and Malta, as we have already seen, is without rain for a great part of the year

The tanks are cut out of the solid rock. They are carefully lined with cement to prevent escape of water, which, nevertheless, occurs; and they are arched over, leaving an opening above, through which the water is drawn by hand or by means of a pump.

The quality of the water is said to be very good throughout, except where there has been neglect in cleansing the tanks, which are apt to become foul, and the water unwholesome, during the dry season. The sanitary objections to this method of storing water are, that underground water-tanks are liable to pollution by infiltration of sewage or surface impurities, that they leak and waste the water, and that they render the basements of houses more or less damp.

The water is raised and distributed for use by hand labour, except in a few cases where there are open conduits connected with public fountains supplied by the aqueduct. This method, besides its inconvenience, limits the use of the water very materially; and one of the greatest improvements in the distributing arrangements would be to introduce a constant supply at pressure. Even the existing supply of aqueduct water, as

we shall presently show, would yield nearly 7 gallons a head per day to the whole garrison, including troops, a fact which, when compared with the actual amount of water available for use, is sufficient to show the large extent of waste continually incurred by open fountains and by leakage from tanks. Both sources of waste could be easily avoided by improved means of distribution.

It will be seen from the report of the collector of land revenue in Appendix No. 7, that he recommends a constant supply to be provided for all civil and military buildings by pumping water from the existing underground tanks into cisterns at a sufficient elevation; but where there are such ample facilities as exist at Valetta, this method ought not to be necessary. If the aqueduct supply were extended and conveyed in pipes to distributing reservoirs placed on the higher levels of the towns, water might be sent by gravitation over every part of them, and would render efficient house drainage much more easy than it will otherwise be.

This improvement would render necessary the abolition of open fountains and the introduction of water pipes and water taps, but it would in no way interfere with the storing of water required during a siege, which could be resumed if it became necessary.

If we take the available water-supply for Valetta and Floriana, during the dry season, at 337,000 gallons a day, and the population of Valetta and Floriana, including the troops, at 36,000, the present aqueduct water supply would give about 9 gallons per head per day. The aqueduct supply for 25,000 people, including troops, in the other cities would give only 3½ gallons a head per day; but it is possible that it might be increased from other sources. If the present supply from both aqueducts were equally distributed over the garrison, it would give nearly seven gallons a head per day. Next to improved drainage an extension and proper distribution of the aqueduct water is the most necessary improvement for these towns.

*Improvements already carried out.*—We have already alluded to the improved sanitary condition of Valetta, which we have much pleasure in stating is likely to progress under the present enlightened government.

Besides many important reforms which have been carried out in the general administration of the island, the care of public health has not been neglected.

An ordinance against adulteration of food or drink (Appendix, No. 14) has been promulgated. Public squares have been planted, and European fruit-trees and improved breeds of sheep introduced. Great improvements have been made in the administration of charitable institutions. An excellent lunatic asylum for 300 patients has been built; a large asylum for aged and infirm poor, a hospital for incurables, a foundling hospital, and Magdalen asylum, and a prison for women, embodying all recent improvements, are about to be built. We have had much pleasure in giving our assistance as regards the sanitary details of the plans of these establishments, prepared by T. H. Wyatt, Esq., and when all are completed this little island will have the finest charitable institutions any where to be met with. The civil hospital, Floriana, has been improved. Drinking fountains have been established. An admirable public market on the most improved model has been built, at a cost of 17,000*l.*, and has been so well let that it returns a rental of 4,300*l.* per annum. Gas-lighting has been extended. All public and private water tanks have been repaired; 16 large new public tanks constructed; and an addition made to the water-supply by the purchase of a spring. Eight public ovens have been constructed, and dwellings for the poor on an improved plan are being built. 3,500 acres of waste land have been brought under cultivation on improving leases. Large public works, as, for example, the new harbour, which will cost 132,000*l.*, have been undertaken; employment has been given to a number of people; and mendicity, the curse formerly of Malta, has been considerably diminished by repressive measures.

An entire new suburb of model dwellings for the labouring classes will, in all probability, be constructed in connexion with the new harbour. Plans were advertised for, and several very good plans were sent in, one of which, after undergoing some improvements in detail, was selected as a model. The building ground will be leased subject to the adoption of the plan; and, as the improved houses are built, Valetta will be cleared of the old unhealthy tenements which are at present its opprobrium. Appendix, Nos. 12 and 13 show the steps which have been hitherto taken to give effect to this important improvement.

It is also proposed to lay out a new cemetery, to meet the wants of the civil population, and with the view of abolishing interments in churches, a practice which we are sorry to say still exists in Malta, although it has been abolished in all the more enlightened states of Europe, whether Catholic or Protestant. The civil government is very desirous of giving effect to this great improvement, in which we sincerely trust they will be supported by enlightened public opinion in the island.

Building improved dwellings, and a gradual reconstruction of the worst parts of the towns, with due regard to ventilation, light, drainage, and diminution of overcrowding, are no doubt the ultimate objects to be aimed at; but in the meantime the sanitary improvements we have pointed out in sewerage, house drainage, water-supply, internal cleanliness, ventilation, and general improvement of existing houses, are absolutely necessary for the preservation of the health of the garrison, and they would become doubly important in case of war. We strongly recommend their being taken up by the local government, and carried out, not only in Valetta, but in Vittoriosa, Senglea, and Cospicua, in many parts of which, especially of the last, they are most urgently required.

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## SECTION II.—SANITARY CONDITION OF THE GARRISON.

Before proceeding to describe the general sanitary condition of the barracks and hospitals, we shall state the nature of the diseases from which the troops in garrison have suffered, and the mortality arising from them.

### 1.—Diseases of Troops.

Full and satisfactory information on the health of the troops is contained in the statistical reports on sickness in the army, 1839 and 1853, and also in the report of the army medical department for 1859, digests of which are given in the Appendix (Nos. 15, 16, 17). From these reliable sources of information we learn that during the first period contained in the reports, 1817 to 1836, the corrected annual mortality was 18·7 per 1,000. Of this amount 2·9 per 1,000 was due to fevers, 3·6 per 1,000 to bowel diseases, and 6 per 1,000 to diseases of the lungs. The fevers were intermittent, remittent, common continued, synochus, and typhus. The first two fevers in the group, which are generally connected with local malaria, furnished one-eighth of the admissions to hospital from fever, and one-seventh of the deaths. The last three afforded seven-eighths of the admissions, and six-sevenths of the total deaths from fevers.

Common continued fever was the cause of by far the greater proportion of deaths from this class of diseases.

The bowel diseases were dysentery and diarrhœa, with a few deaths from cholera. The chest diseases were consumption and bronchitis.

The mortality from the zymotic class during these years was 6·5 per 1,000; adding to this 6 per 1,000 for chest diseases, we find that above two-thirds of the whole mortality were due to these two classes.

The group of years from 1837 to 1846 shows an annual mortality of 19·36 per 1,000. Of this 1·79 per 1,000 was due to fevers, chiefly common continued; 2·41 per 1,000 to diarrhœa, dysentery, &c.; 6·38 per 1,000 arose from tubercular diseases, such as consumption; and 1·65 per 1,000 from other diseases of the respiratory organs, chiefly bronchitis. We have again the two classes of zymotic and chest diseases affording upwards of two-thirds of the total mortality of these years.

A return (Appendix, No. 18) prepared for us by Inspector-General Forrest, late principal medical officer of Malta, for 10 years preceding 31st March 1859, shows that the deaths from fever were nearly a fifth part of the total deaths; that consumption furnished nearly a sixth part of the mortality. The deaths from diarrhœa, dysentery, and cholera were about 40 per cent. of the total deaths. The mortality from zymotic and chest diseases during these years (including cholera) was 84 per cent. of the total mortality, and, excluding cholera, about 50 per cent.

The last published return for the station, is that for 1859, in the army Medical Department report, which gives the mortality for that year at 19·02 per 1,000. No less than 8·85 of this was due to continued fever. The zymotic class gave a mortality of 11·11 per 1,000; consumption and other chest diseases gave 1·69; and the zymotic class conjointly with chest diseases occasioned 79 per cent. of the total mortality of the year. In 1859, 46½ per cent. of the deaths, and in 1860, according to a return furnished to us by Dr. Langley, acting principal medical officer, nearly 43 per cent. of the deaths arose from fever.

We have seen that among the civil population "boils" and "anthrax" prevail. Such affections also occur among the soldiers, but they rarely lead to fatal results. They are common in the army everywhere, and are generally included under two heads "boils" and "abscess." There were 637 admissions from these affections in Malta during 1859, and 632 in 1860. During the latter year there were 27 cases of the more severe form, "furunculus," and three cases of carbuncle ("anthrax") admitted, all of which recovered There were also two cases of "anthrax" in 1859. It may be here stated

in connection, that in 1813, 28 soldiers were attacked with plague, of whom 21 died; a very small relative mortality when compared with what occurred among the civil population.

The prevalence of fever among the troops, and the high and increasing ratio which the mortality from it has attained, has attracted the serious attention of commanding and medical officers; and it was this circumstance which induced the late Lord Herbert to direct an inquiry to be made into its causes.

In doing so it is necessary to analyze the facts somewhat more in detail; and for this purpose we have obtained information from various sources, the results of which we proceed to discuss, beginning with the seasons during which fevers are most prevalent.

Dr. Burrell, in his report on the plague of Malta, has given the following table showing the relative prevalence of fever in the garrison from 1816 to 1851 inclusive, for the months during which plague prevailed in 1813:—

| —— | April. | May. | June. | July. | August. | September. | October. |
|---|---|---|---|---|---|---|---|
| Annual average Admissions (Military) - | 20·8 | 24·9 | 47·1 | 82·5 | 75·4 | 70·4 | 34 |
| Deaths from Plague among the Civil Population, 1813. | 3 | 110 | 800 | 1,595 | 1,042 | 674 | 211 |

This table shows the monthly rate of increase of febrile disease among troops in Malta on 36 years of observation. We have given in Appendix No. 19, an interesting table prepared by Dr. Langley to show the monthly rate of sickness in the garrison, over a period of five years, 1855–60, in comparison with the fever rate. The month of July in each year furnishes the largest amount of fever, a result which corresponds with that given by Dr. Burrell. The months of July, August, and September are the fever months. The month of June follows next in order of unhealthiness from fever, and then the month of October. Here again we have a correspondence in the two sets of data, pointing to the same general law of the march of fever, and which becomes of greater interest when it is found to be the law of increase also of plague. As regards other diseases Dr. Langley's table shows that, taken as a whole, these diseases are less under the influence of the monthly law of increase, although the summer and autumn months are the most unhealthy.

The following table, giving approximately the probable ratios in which fever and other diseases may be expected to occur during each month in the year, is deduced from Dr. Langley's data. It shows that for every 15 cases of fever occurring in January 150 may be expected in July; while for every 16 cases of other diseases occurring in January 22 may be expected in July, and so of the other months.

| —— | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fevers - - - - - | 15 | 17 | 19 | 15 | 22 | 85 | 150 | 91 | 102 | 45 | 26 | 22 |
| Other Diseases - - - | 16 | 14 | 17 | 14 | 15 | 18 | 22 | 24 | 23 | 22 | 18 | 16 |

Whatever may be the cause of fever in the garrison, it is obviously most active during the hot months of the year, at a period when there is little or no rain. Increase of other epidemic diseases besides fever has frequently been observed in dry seasons. Absence of rain, in warm climates especially, is attended by consequences of a very important kind as regards the public health. It denotes deficient means of cleansing; accumulated filth, especially in badly constructed sewers, or in open drains and channels, giving rise to malaria; failing water supply attended by a corresponding increase in the amount of organic and inorganic impurities in the water. Impure air, impure water, and an increase of epidemic disease are coincident, and on the other hand it is frequently observed that a heavy rain-fall taking place during the prevalence of an epidemic is attended by a great diminution of the disease. The cleansing power of the rain, leading to the removal of sources of foul air, a large supply of purer water, and abatement of disease are coincident. The sanitary condition of drainage and water supply at Malta is, as we have seen, very much under the influence of the rain-fall, and the facts appear to indicate that improved drainage connected with improved water supply in the manner we have recommended would lead to diminution of fever during the warm dry months of the year. As regards the prevention of fever among the troops, it is evident that precautionary measures should be put in practice specially in spring, before the increase of fever commences.

The next point of importance is to determine the localities where fevers have been most prevalent.

The earliest information we have on this point is contained in the statistical reports on sickness and mortality in the army, 1839, in which it is stated that the ratios of admissions and deaths from fevers have shown a remarkable diversity in different parts of the garrison. This is shown in the following table exhibiting the ratios per thousand per annum of admissions and deaths from fevers in each of the three districts within the lines for a period of eight years.

| | Valetta. | Cotonera. | Floriana. |
|---|---|---|---|
| Admitted - - | 133 | 178 | 217 |
| Died - - - - | 1·4 | 3.5 | 4· |

We have here the singular fact presented of the most healthy district in Malta, Floriana, affording the largest number of admissions and deaths from fever among the troops quartered in it. The information is given by the reporters, with the reservation that the data on which the calculations were founded were not in their possession, but admitting its correctness the fact at once arrests attention, and proves that the troops were exposed to some condition absent from the civil population.

When cholera first visited Malta, in 1837, it attacked the troops in barracks in the following order: Floriana, St. Elmo, Valetta, Cotonera. One officer, 47 men, 21 women, and 9 children died. Fever was very prevalent at the same time.

The same epidemic, as already stated, cut off 3,783 of the inhabitants of Malta.

In the statistical report of 1853 the prevalence of continued fever in the barracks on the Cotonera side is attributed to the state of the dry dock at the upper end of Dockyard creek.

The precise effect produced by residence in particular barracks has not yet been ascertained, although it will in future be deduced with some degree of accuracy by the new statistical forms. Appendix Nos. 20 and 21 show the kind of evidence at present available in dealing with this question. The first of these tables gives the admissions and deaths from fever among three corps located during the unhealthy season of 1859 in three sets of barracks. The annual mortality from fever among the 2nd battalion 3rd regiment at Floriana, Isola gate, St. Elena gate, was in the ratio of 6·1 per 1,000 strength. The annual mortality from fever among the 2nd battalion 15th regiment at Fort Verdala, Floriana, and Fort Manoel was 9·5 per 1,000. And the mortality from fever of the 2nd battalion 22nd regiment at Fort Manoel and Floriana, the former barrack being occupied during the whole of the unhealthy season, was 5·1 per 1,000. In the first two examples Floriana barrack and Verdala barrack were occupied for the same days exactly by each corps. The facts appear to indicate the existence of some special cause of disease in both barracks.

Appendix No. 21 shows the result of interchange of barracks by two corps of nearly the same strength,—the 2nd battalion 23rd regiment, and the 4th battalion rifle brigade,—at a time when both were exposed to an obvious cause of disease. The barracks occupied were Lower St. Elmo and Fort Ricasoli. The former has its foundations close to the level of the sea. The subsoil is damp, the drainage bad and offensive, and the barrack has insufficient external ventilation. Fort Ricasoli is well ventilated externally, except one series of casemates, where the fever chiefly occurred.

About the middle of September, 1859, the saturated ground of the barrack square of Lower St. Elmo was opened to lay down gas-pipes. The barrack was occupied at that time by the rifle brigade, which had been in it from the 1st March, 1859. From that date until the opening of the ground there had been two deaths from fever. The corps was moved to Fort Ricasoli on the 26th September, and appears to have been so injured by the malaria that six deaths took place at Ricasoli before the end of the year.

The 2nd battalion 23rd regiment was at Fort Ricasoli from the 1st March till the 26th September, on which day it relieved the rifle brigade at Lower St. Elmo. Up to that date there had been six deaths from fever. On the 23rd it came into the midst of the evil at Lower St. Elmo, and lost 11 men by fever before the end of the year. The evidence as to the effect of locality in this case is of weight when taken along with other facts.

More precise evidence as to the effect of locality is given in a table (Appendix No. 22) drawn up by Dr. Langley, showing the comparative prevalence of fever and of mortality from it, in well-defined groups of men living in the larger barracks between January 1st and December 31st, 1860. There were 1,267 cases and 24 deaths from fever in the

garrison during the year 1860, and the following table gives the localities of 1,154 of these, arranged in the order of highest mortality :—

| Barrack. | Fevers per 1,000 per annum. | |
|---|---|---|
| | Admitted. | Died. |
| Floriana | 282 | 8·4 |
| Verdala | 290 | 7· |
| Lower St. Elmo | 162 | 3·4 |
| Fort Manoel | 115 | 2·3 |
| Isola gate and St. Francisco<br>Couvre Porte, Vittoriosa | 204 | 1·2 |
| Ricasoli | 295 | 1·16 |
| St. James' Cavalier | 1 | None. |

The whole of the evidence bearing on the question of locality gives of course only approximate results, because these are influenced by other causes than the mere position of the troops—as, for instance, the state of the hospitals, the general health of the corps, &c.; besides, one year's returns are not enough on which to found positive conclusions. So far as they go, however, they point to the same conclusion as the facts already mentioned, and exhibit rather a striking conformity with what happens to be the relative sanitary state of the barracks.

At the time we were in Malta the effect of Floriana barrack on the health of the troops was brought before us, chiefly on account of the large amount of fever which had come from it. In order to relieve the overcrowding, a part of the men had been placed in badly ventilated wooden huts in an adjacent bastion, having interchanged once with the men in the barrack. The facts as laid before us show that during six months of 1861, including the most unhealthy months of the year, there were 204 cases of continued and typhoid fever in a force of 716 men. The medical officer attributed the result to overcrowding and defective ventilation.

During the entire period which has elapsed since the first hospital records were kept in Malta, the prevailing type of fever has been common continued.

Out of 22,969 cases of fever admitted into hospital, of which we have accounts, 21,122 have been registered as of this type. Many of the cases have been very slight, and mild in character, passing off in a day or two, and apparently the result of exposure, but still entered on the records as cases of fever. Other slight febrile attacks, the result of debauch, have generally been until lately classed under the same category. A large proportion of these continued fever cases have thus been of little comparative importance, but, nevertheless, five-sixths of the deaths from fever have been occasioned by this disease. The type next in frequency has been remittent fever, which has supplied about 5½ per cent. of the fever admissions, and about 9 per cent. of the fever deaths. Intermittent fevers have been so rare as to make it probable that they were imported. Only 17 cases of typhus are on record; and typhoid fever appears for the first time in the returns for 1860, in which year there were 41 cases and 12 deaths from this disease, although from information supplied by medical officers it appears doubtful whether many of the fatal cases classed under the head of continued fever have not been in reality typhoid in character, or have become so during their course.

It is evident from what has been stated regarding the climate and topography of Malta, and from the nature of the severer types of this fever, that its cause is not connected either with the climate, except in the slight cases alluded to, or with the surface of the country; and that any local causes of the more severe forms are to be sought for in the barracks and hospitals, or in the sanitary condition of the neighbourhood where they are placed.

A similar remark is applicable to the prevalence of consumption. There is nothing in the climate to predispose healthy people specially to this or other chest diseases: although the hot season, with its dry and exhausting atmosphere, may tend to develop consumption in men who bring the seeds of it with them, and although the higher elevations in the island are unfavourable for existing chest diseases generally. But admitting all this, there is no reason connected with the country or climate why (as stated in the statistical report of 1853) more troops should die of consumption in Malta than die of the disease in Canada, unless the men are actually consumptive at the time of their arrival in summer; and in this case, whatever the climate may do to develop the disease, it is quite certain to find a potent ally in the present sanitary condition of the garrison. In pursuing the inquiry by examining into any local causes of unhealthiness, it is impossible to

separate between the sanitary state of barracks and hospitals and that of the towns in which they are situated; any general causes of insalubrity affecting a district, will affect the barracks and hospitals situated within it. Defective town drainage, obstructed external ventilation, damp subsoil, or foul air from nuisances will taint more or less the atmosphere in and around barracks in the neighbourhood, and high temperature is an important element in calling these causes into greater activity. The larger Cotonera barracks and Lower St. Elmo are perhaps the most exposed to these general causes of insalubrity. But all of them contain sufficient elements of unhealthiness in their local position, construction, overcrowding, defective ventilation, bad drainage, and insufficient water supply, to account for most of the evil. Hardly any of the barracks are good, several are very indifferent, and some are very bad. The hospitals within the lines, where sick men are treated after removal from barracks, are the worst part of the accommodation—a fact not to be lost sight of in estimating the probable causes of mortality.

The natives of Malta are exposed to the same topographical and climatic conditions. They inhabit buildings constructed of materials of the same kind as those used in barracks. They are subject to bad drainage, dampness, filth, overcrowding, bad ventilation, inferior dwellings, and their domestic habits and food are not always of a healthy kind. They suffer from consumption and tubercular disease, and also from the usual tribe of zymotic maladies. Natives and British troops are exposed to the same local conditions, although in different degrees, and both suffer from the same classes of diseases. Although of course the British soldier is more likely to suffer from the heat and dryness of the climate, at least on his first arrival.

We next proceed to give the general results of the sanitary part of our inquiry, beginning with the local position and construction of barracks. We shall give subsequently the details regarding each barrack separately.

## 2.—Sanitary Condition of Barracks.

The following is a list of the barracks and hospitals we have examined in the islands, their situation, and the regulation number of men in them, contrasted with what the number of men in each barrack ought to be for healthy occupation:—

| Situation. | Name of Barrack or Hospital. | Regulation Number of Men. | Proposed Number of Men. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|
| Valetta | Upper St. Elmo | 226 | 181 | 45 |
| | Lower St. Elmo | 748 | 616 | 132 |
| | Marsmuscetto | 84 | 60 | 24 |
| | St. James' Cavalier | 136 | 118 | 18 |
| | Strada Torre | 476 | None | 476 |
| | St. Peter's Lower Counterguard | 269 | 138 | 131 |
| | General Hospital | 382 beds | — | — |
| Floriana | Floriana Barracks | 560 | 362 | 198 |
| | St. Francis Floriana | 329 | 213 | 116 |
| Ricasoli | Fort Ricasoli | 412 | 300 | 112 |
| Vittoriosa | Fort St. Angelo | 118 | 80 | 38 |
| | Vittoriosa Gate | 120 | — | 120 |
| | Couvre Porte | 62 | 52 | 10 |
| | Vittoriosa Hospital | 146 beds | — | — |
| | Hired Hospital | 56 „ | — | — |
| Senglea | Isola Gate | 277 | 231 | 46 |
| St. Margaret's Lines | St. Francis di Paola | 149 | 114 | 35 |
| | St. Elena Gate | 200 | 100 | 100 |
| | Verdala | 690 | 552 | 138 |
| Cotonera Lines | St. Salvator | 132 | 132 | — |
| | Zabbar Gate | 183 | 120 | 63 |
| | St. Clements' | 56 | 39 | 17 |
| | Polvarista | 252 | 216 | 36 |
| | Zeitun Gate | 41 | 41 | — |
| Quarantine Harbour | Fort Manoel | 317 | 258 | 59 |
| | Fort Tigne | 106 | 79 | 27 |
| St. George's Bay | Pembroke Barrack | 1012 | 1012 | — |
| St. Julian's Bay | Spinola Hospital | 42 beds | — | — |
| Citta Vecchia | Sanitarium | 88 „ | — | — |
| Gozo | Fort Chambray | 395 | — | — |
| | Fort Rabato. | | | |

In these barracks and hospitals, exclusive of Chambray and Rabato, there is regulation space for 6,955 men, and hospital beds for 714 sick.

In describing the condition of these buildings it is necessary to state at the commencement that they appear never to have been constructed as barracks nor intended to be used as such by troops except on the approach of an enemy or during a siege. In the time of the Knights of Malta, the garrison was scattered all over the islands. The men lived with their families, and were only called together for special purposes. The great casemated structures now crowded with troops were at all ordinary times unoccupied, or they were used as stores and armouries. Lower St. Elmo was built for a store, and as a place of refuge for women in case of siege. Marsamuscetto barrack was a store. Floriana barrack, the most unsuitable building in the whole command for human habitation, was a sail cloth manufactory, where able-bodied old men, otherwise incapable of earning a living, were employed.

Vittoriosa hospital was a district armoury, and people are still living, or were so lately, who remembered the country people coming to it to deposit their clothing, and receive their uniform and arms. The barracks were only occupied by guards. It was not till a later age that the buildings were considered suitable either for troops or sick.

### 3.—Local Position of Barracks.

The lowest barrack in point of situation is Lower St. Elmo, the basement of which is damp from infiltration of sea water, for the parade-ground is only four feet above water level, and also from sewage and drainage descending to it from the higher levels. During a gregale the ground becomes soaked with wet. It is entirely enclosed by lofty walls, so that it can be looked down into like a pit, and the rooms are cut off from the sea breeze. The highest barrack is St. James' Cavalier, which is nearly 200 feet above the sea; it overtops the town, and is exposed to every wind that blows. Between these degrees of elevation all the other barracks are situated. They differ considerably as regards external ventilation. Fort Manoel, and Fort Tigné in the Quarantine harbour, are considerably raised above the water, and have a free and healthy exposure.

Upper St. Elmo, although at the foot of the slope descending from the upper end of the town, is at a considerable elevation above the sea, but its construction is not the best adapted for freely ventilating the buildings. Marsamuscetto barrack is exposed to the sea breeze on one side, but it is built against a lofty wall of rock, which, indeed, forms the end wall of the casemates, and it is not healthy. St. Peter's Lower Counterguard on the opposite side of Valetta, overhangs the Quarantine harbour, and is freely exposed to winds from north-east to south, but specially so to the sirocco. It is built against a wall of rock, and the lower tier of rooms are damp and unwholesome. Floriana barrack is about 100 feet above the water level, but is so enclosed by walls more lofty than itself that it has no external ventilation worthy of the name. St. Francis Floriana is situated in a public street, but is open behind.

Of the barracks to the S.E. of the Great harbour those in Fort Ricasoli have the best exposure. They are high, and their doors and windows face the N.W., except one line of casemates in the curtain facing the N.E. These casemates are unhealthy, and yield fever cases among their inmates, partly because the ventilation is obstructed by walls along the face of the rooms a few feet from the doors. Fort St. Salvatore is high and well exposed. Fort St. Angelo, which crowns the point of Vittoriosa, is in a high and healthy position, in the middle of the Great harbour. Vittoriosa, Couvre Porte, Isola Gate, and St. Francesco di Paola barracks are hemmed in by walls and other buildings, and have little external ventilation; while their proximity to the houses of the civil population of a crowded, not over-cleanly district is far from being favourable to health. Verdala barrack, a recently built one, is a closed fort surrounded by high walls, which cut off its external ventilation, and it is besides close to a densely peopled part of the town.

Barracks flanking gates differ in some respects; but none of them are good, except Polverista barrack, which is loftily situated, and is well exposed to the air.

By far the best barrack in point of situation is Pembroke barrack, St. George's bay. It is in the open country, and occupies the crest of a rising ground overlooking the sea at a sufficient elevation to ensure good drainage.

Leaving out Pembroke barracks, which are 3 miles N.W. of Valetta, above two-thirds of the garrison are barracked in localities in which external ventilation is deficient, a defect which can neither be wholly compensated nor removed.

### 4.—Construction of Barracks.

The general plan and construction of all the buildings now used as barracks within the lines, except St. Francis Floriana, has been determined with reference to the defensive works; and all of them, with two or three exceptions, are deficient in the requisites for health.

All of them are casemated buildings, generally in the curtains or flanks, and in only two or three instances are the casemates detached from the works with a passage round them. The works generally rise above the roofs of the barracks: the roofs being, in most cases, paved and used as platforms for guns.

An evident result of this plan is that the barrack squares and parade grounds are sunk far below the tops of the surrounding buildings; and, as most of the light and ventilation are derived from the court-yard, there is never a free circulation of air in the rooms, except during winds.

Rooms in detached blocks, if properly ventilated and not overcrowded, are much better than those built into the works, because the air plays more freely round them; and they are cut off from damp, which always more or less affects the air of rooms where one side, or one end, happens to rest against the earth or rock of the rampart.

The best example of these detached ranges is in Upper St. Elmo, and is shown in the following figure.

Fig. 9.—Plan of Nos. 1 to 10 Soldiers' Rooms, Upper St. Elmo.

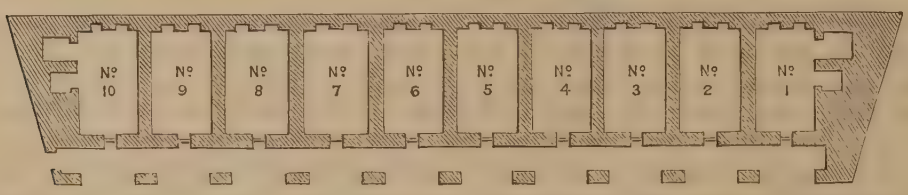
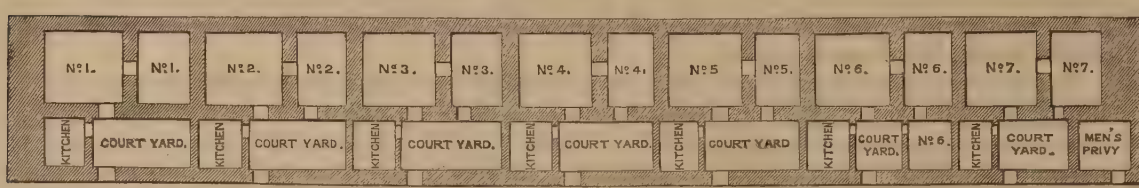



Fig. 9 is a ground plan of the lower floor. The rooms are all nearly of a size. They are 24 feet 5 inches long, 14 feet 8 inches broad. The side walls are 7 feet 2 inches high to the spring of the arch, which has a rise of 5 feet 4 inches. The front faces nearly due south, and is protected by an arched verandah. All the rooms, except the school room, have one small window over the door, and two in the wall at the end opposite the door; some of the rooms have an additional opening, but only part of the windows have glass, and these do not open at the top. The other openings have simply wooden shutters, which are usually kept closed. The rooms have each eight men in them.

Fig. 10 is a ground plan of a similar range of rooms in Fort St. Angelo.

Fig. 10.—Plan of Soldiers' Rooms, Fort St. Angelo, Nos. 1 to 7, and Men's Privy.




These rooms are on a ground floor only, and are connected two and two. Each pair of rooms has two small lights between them, and there is a wall in front higher than the door, which interferes with the ventilation. The rooms are arched, and have a flat roof.

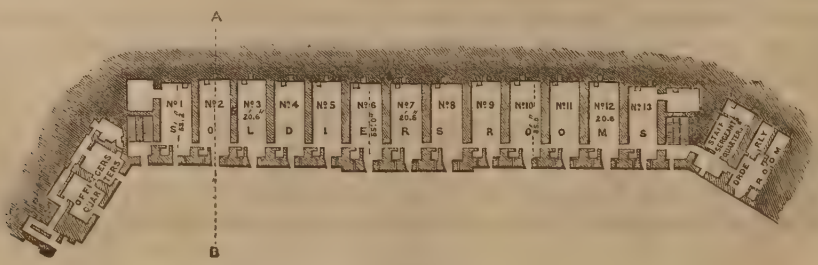
There are also detached blocks of casemate rooms in Fort Manoel.

There are numerous examples of very unsuitable barrack rooms forming part of the works, and where the situation is confined they are the most unhealthy portion of the accommodation.

Two or three examples of this form of construction will show how this happens.

Fig. 11 shows the construction of Lower St. Elmo barracks, which, as already stated, are entirely sunk below the surrounding levels. They consist of three floors of arched

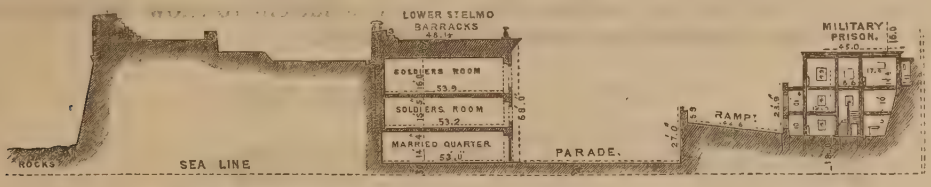
Fig. 11.—Lower St. Elmo Barracks.—Second Floor.



rooms built against the curtain, and of course without any windows at the end. The only opening to the outer air is a window into the sunk yard in front, and there are doors only at the ends. All the rooms on each floor communicate by arches at the front ends. The most distant beds are about 50 feet from the window. The rooms at present occupied, hold from 24 to 38 men each.

Fig. 12 gives a section across the barrack, showing the relation of the surrounding walls and sea to the barrack rooms; but the ground and buildings in front, above and behind the prison, as well as the walls of Upper St. Elmo, at the end of the parade ground, rise to more than double the height of the barracks.

Fig. 12.—Section through Lower St. Elmo Barracks and Military Prison.

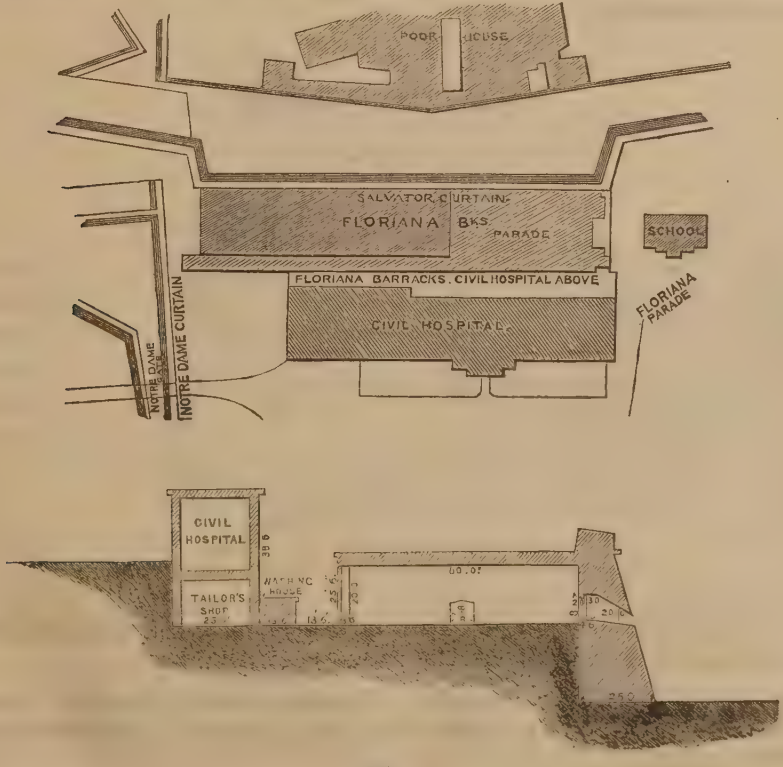



This building as already stated was originally constructed by the knights of Malta for stores, and was never intended for permanent human habitation. It has been occupied by troops in the face of repeated representations as to its unsuitableness. The ground floor is now given over for cook-houses, schools, &c. The two upper floors are still occupied by troops.

Marsamuscetto barrack, is another store erected by the knights which is now used for troops. The rooms are partly cut out of the soft sandstone rock which rises many feet above them; they are damp and unhealthy. It is stated that sappers who work all day in the open air do not suffer so much in them as other troops, who have less active exercise and exposure.

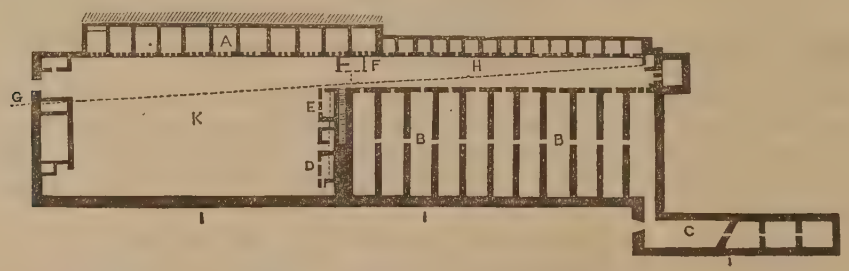
Floriana barrack, Fig. 13, affords a good illustration of the effect on health of bad construction *per se*. It stands high, and the position is as healthy as any in the healthy neighbourhood where it is situated; but human ingenuity could hardly have been more successful in adapting means to an end, if the end were to keep the barrack constantly full of stagnant foul air. There is, of course, the countervailing fact that the place never was built for a barrack.

Fig. 13.—Block Plan and Cross Section of Floriana Barracks, showing their Relation to the Civil Hospital.



This barrack consists of one set of small barrack rooms built against the hill-side without any opening behind. Over this range of rooms is one entire side of the Civil Hospital, which is built in two squares on the higher ground. This large building completely cuts off the ventilation on one side, and the rooms under it were so unhealthy that they have been removed from the construction as barrack rooms. The remainder of the barrack accommodation consists of a series of large casemates, 80 feet in length, with the ends opposite the doors, built against the parapet of the works, which rises above their roofs. They have a window over the door, and all the casemates communicate by arches in the division walls. No current of fresh air can ever reach the interior, for they are completely cut off from prevailing winds; as the men expressed it, "Our breath never seems to leave us;" and no wonder. The ground plan of these rooms, Fig. 14, and also the plan and section, Fig. 13, are sufficient to show the source of the fever by which these barracks have been so long infested.

FIG. 14.—PLAN OF FLORIANA BARRACK ROOMS.

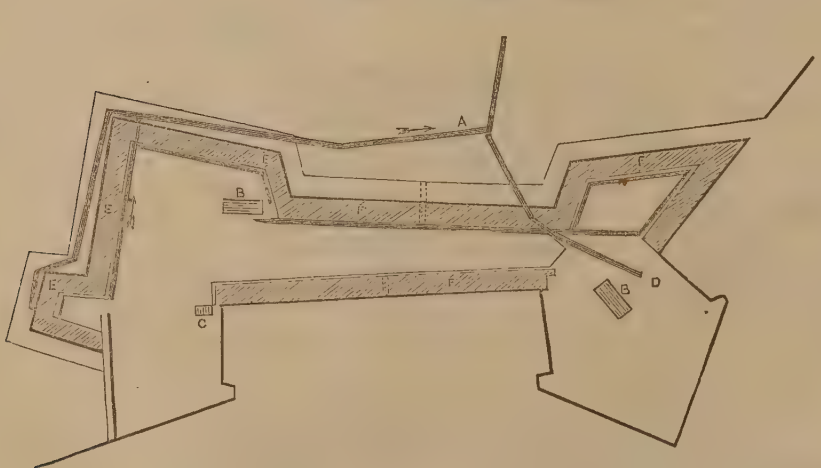



A. Range of barrack rooms, with the Civil Hospital over them.
B. Long casemates, with openings only at one end.
C. Casemates opening out of them.
D. Privies.
E. Women's wash-house.
F. Ablution shed.
G. Covered drain.
H. Open drain in a narrow passage in front of barrack-room doors.
I. I. I. Parapet rising above the barrack rooms.
K. Parade ground.

As elsewhere stated, this great defect of stagnant air has recently been partially remedied, by opening an embrasure through the parapet at the end of one of the casemates furthest from the door.

Verdala barrack, a plan of which is given in the following Fig. 15, is completely enclosed by its own walls and by higher ground. It is two floors in height, the upper one being reached by an outside terrace. The rooms are all arched, and have a door and window towards the parade ground; but towards the outer air there are only three small loopholes, 15 inches high by 3 inches wide, to each room. The outer ventilation is in this case also defective.

FIG. 15.—VERDALA BARRACK.




A. Drains.
B. Tanks.
C. Dung heaps, &c.
D. Privies.
E. Officers' quarters.
F. Soldiers' do.

Fort Tigné is enclosed by its walls in a similar manner, and the casemates are built with their ends against the walls.

Part of St. Peter's Lower Counterguard, (Lascaris) recently built, is found to be so damp and unhealthy as scarcely to admit of its being occupied; a result which has arisen in the following manner.

There are two floors of barrack rooms, but, except a small court, the surface of the parade ground is on a level with the upper-floor rooms, and all the lower floor rooms are sunk below its level, leaving only a narrow passage seven feet wide between the doors and a vertical wall of rock 19 feet high. The parade ground is moreover bounded on the side opposite the officers' and soldiers' quarters by a lofty escarp and walls cutting off the external ventilation on the north and north-west sides from which the healthy winds blow. The causes of disease arising out of the construction of the work are, want of fresh air, damp, and want of light.

Figs. 16 and 17 show a plan and section of this work.

FIG. 16.—LASCARIS COUNTERGUARD, VALETTA.

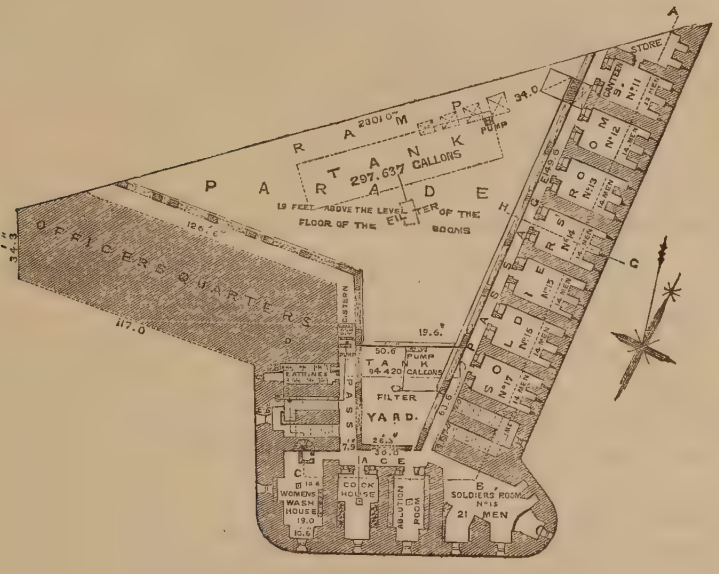
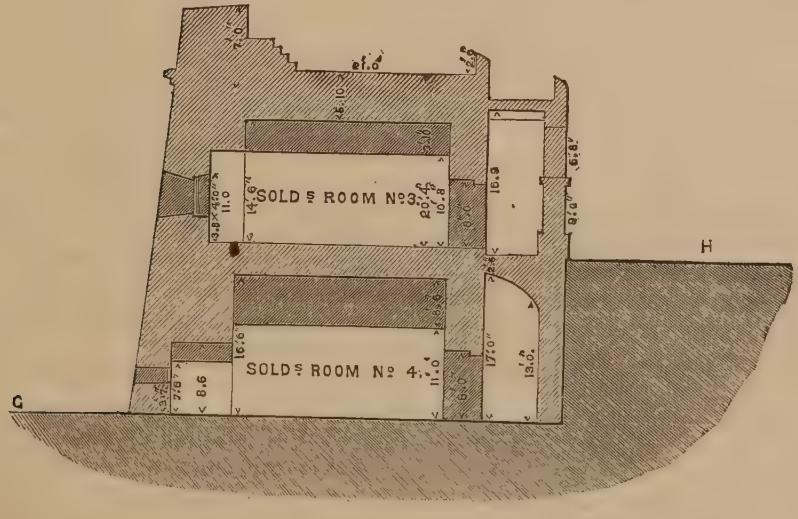



FIG. 17.—LASCARIS COUNTERGUARD, VALETTA.

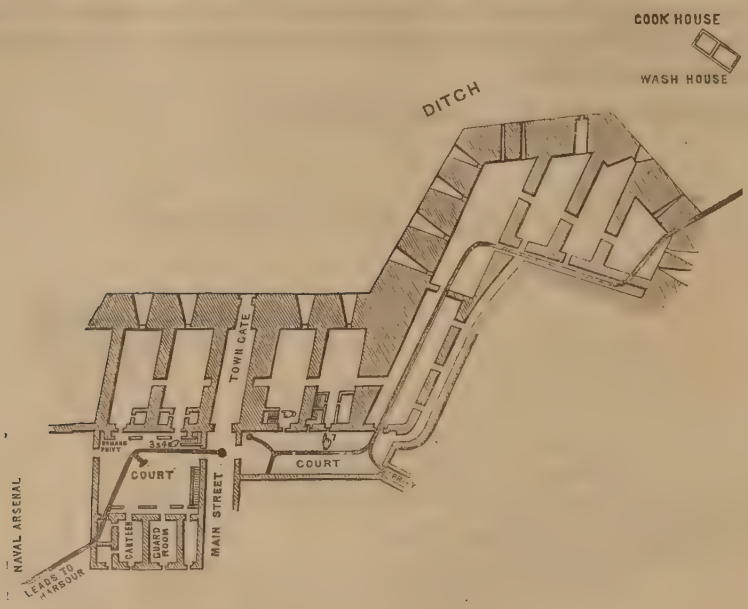



The large casemates of Fort Ricasoli are of a different construction. They are built with one side against the defences, the rampart forming one of the piers of the arch. The other pier is a long thick wall strengthened with counterforts, and having windows at the spring of the arch. The lower parts of the counterforts outside are enclosed for married soldiers' rooms.

The barracks intended for the defence of gates are generally by no means healthy,

on account of defective construction or position. Perhaps the worst of them is Isola Gate barrack, shown in the following figure.

Fig. 18.—Isola, or Senglea Barrack.




It is complicated in structure, dark, and at times damp. The rooms are completely enclosed by high walls, on one side and are very deficient in light and in outer ventilation. Some of them have windows at one end only, and others have no light except from embrasures.

These plans afford a good general idea of the nature of the barrack accommodation in Malta; and they exhibit the chief structural defects, especially in the older class of barracks. In not one of them has there been any successful attempt at combining the requisites of healthy construction with the purposes of defence; and, although they admit of some improvement, they will from their very nature occasion a certain annual loss from sickness, mortality, and invaliding, so long as they are occupied. Some are of course worse than others, but not one of them shows healthy casemated construction.

The new Pembroke barrack at St. George's bay is a very different building from any of the others. It occupies a healthy position; the rooms, have doors and windows at both ends, and they are freely ventilated. There are no higher walls of buildings to interfere with this essential condition of health.

*Materials.*—All the barracks are built of porous sandstone, which becomes saturated with water during the rains, unless the roofs are carefully protected by cement. On account of the great thickness of the casemated buildings, the walls retain much moisture, and also the rock near them and under their foundations, which is slowly given off during the warm weather, and is a cause of damp foul air. Wet sometimes comes through the arches and descends into the walls. This was recently the case with the new Pembroke barrack. But it can be prevented by making the roofs water-tight. No wood is used in constructing barracks; all the floors are of stone, and the upper floors are supported on arches. All stairs and passages are also of stone.

Experience generally has shown that wood floors are the most healthy. Maltese stone, from its softness, keeps the air more or less dusty, and the dust is breathed by the men; a fact not to be forgotten in relation to the amount of chest disease already mentioned. Wooden floors are liable to harbour vermin in Malta and when they once become affected in this way it is hardly possible to get rid of the vermin. Hard limestone should be substituted throughout for soft sandstone, a material quite unfit for floors, and by raising the floors when relaid, with ventilation beneath, damp would be cut off.

### 5.—Ventilation.

The ventilation of all the barrack rooms within the lines is defective. In many instances there is no provision except the very imperfect amount of door and window space we have described.

Recently foul air shafts have been introduced in several barracks. They are generally carried up in the back wall, at the end of the arch opposite the door, above the parapet, on the inside of which they open by means of a grated aperture. These shafts are sometimes of large dimensions, as at Lower St. Elmo, but generally they are very much too small to be of use. In some casemates, as for instance at Floriana barracks, there are ventilating openings in the crown of the arch. In a few instances there are inlets in the walls at the end most distant from the foul-air shafts.

In its general aspect the plan is the same as that described in our general report on the sanitary condition of barracks and hospitals in the United Kingdom.

However well that plan may answer for home stations in a cool climate, it is not sufficient for such a climate as that of Malta, especially where barracks are situated in close neighbourhoods, or surrounded by high walls.

Any stillness of the air in so hot a climate is far more injurious than at home, and such a condition prevails wherever the temperature of the air outside and inside the rooms is the same, and when there is at the same time no wind. This rarely happens in our climate, but it is common enough in warmer climates. For this reason, it will not do to trust merely to shafts and inlets for renewing the air in barrack rooms; although they should, as a rule, always be introduced wherever practicable.

At home we can depend on a certain measured quantity of air to maintain efficient ventilation, but in warm climates we have to depend for health rather on the *velocity* with which air is renewed or kept in movement, than on the quantity supplied.

This principle will be better understood by an illustration.

While inspecting the civil hospital at Valetta, we found two wards, side by side, and of the same size, both occupied by sick; they had the same number of male surgical beds, the same exposure, the same number of windows, and the windows of both wards were freely open, and to the same extent. The amount of open ventilating space was, in each case, very much more than would be necessary for keeping the air pure in wards of the same size at home. On examining the ventilation we found the air in one ward pure and fresh, while that in the other was close and stagnant. The reason was, that, in the first case, the air came directly from a distance into the ward by the open windows, and passed through it in a gentle current. In the other case there was a wall at a short distance in front of the ward windows. If this wall had been removed, the ventilation in both wards would have been equally good.

We found the same principle in operation in all the barracks. Wherever a free air-current could arrive without obstruction into any casemate, there the ventilation was comparatively good, even when the construction of the casemate was otherwise bad. Windows on opposite sides, or windows on three sides, we found gave very much better results than the usual doors and windows at one end. We have been in a barrack cook-house which was insufferably hot, although supplied with ventilating shafts several feet square; and we have been in a cook-house four times the size, which was kept cool and pleasant by three open arches at three angles. In the former case the cook-house was not exposed to the wind; in the latter case it was.

The ventilation of existing barracks in Malta is to be dealt with rather by the correct adaptation of these principles to suit local peculiarities, than by definite methods. Each barrack, or rather each room, requires a separate study. A careful examination should be made of the direction in which currents of air move towards or about the buildings, and wherever openings can be made into the rooms, especially near the top of the walls to receive the impulse of the current, such openings ought to be made.

In many instances, as at Floriana, embrasures could be introduced; in other cases additional glazed windows, capable of being opened, should be made, or existing windows could be enlarged. Wherever an air current is introduced in this way there should be other openings either opposite to the place where the current enters, or at right angles to the direction of the current; or, if neither can be obtained, openings should be made through the roof. These ventilating arrangements should be carried out as far as can be done with due regard to the defensive character of the works, until the air in each room is pure during the night. The nearer the ventilating windows or openings are placed to the crown of the arch the better. Ventilating openings or shafts carried up through the roof will always be found useful; and where there is no possibility of taking advantage of outer currents of air, shafts and openings must

be relied on. The best form of shaft ventilator for Malta is Muir's louvred turret, shown in the annexed figure, because it takes advantage of any breeze which may be passing over the roof, and diverts part of it into the rooms below.

Fig. 19.
Muir's Ventilator

This will also be found one of the best ventilators for detached apartments, such as schools, chapels, guard-houses, &c.

Where barracks are in more floors than one, each floor should be ventilated separately; and all floors below the topmost one should have shafts carried up above the roof. It would be a safe rule never to have less than two shafts for a barrack room, adding one or two additional shafts in the longer rooms.

Openings made near the top of the arch should be louvred inside the room to throw in-flowing air-currents up towards the ceiling.

All shafts and ventilating openings should be made on a much larger scale than those for use on home stations. For foul air shafts the area should be one square inch to every 20 cubic feet of contents of the room. Provision should be made for contracting the fresh air openings by one half in case of cold weather. Plans X. and XI. exhibit these ventilating arrangements.

It must be kept in mind that the Malta barrack rooms have no fireplaces, and the ventilating power of the warm chimney-flue, which is of such importance at home, does not exist there.

In many barrack rooms where small loopholes are the only means of ventilation on one side, it is worthy of consideration, whether they might not be very much enlarged, and furnished with loopholed iron shutters to be closed in case of emergency: this would enable the ventilation of many rooms to be immediately improved.

The Maltese building stone is so soft and so easily worked that additional openings can be made in walls at a very small cost.

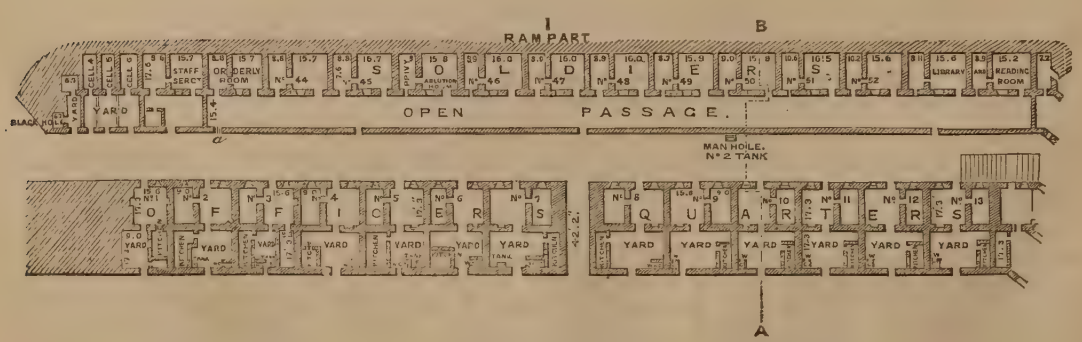
The neighbourhood of barracks should be examined to ascertain whether by removing any old buildings or old walls a current of air could be admitted to the barrack. In some cases good could be done in this way.

For example, at Fort Ricasoli there is a range of casemates in one of the curtains, the inmates of which, as we have stated, have suffered considerably from fever, although the position is elevated and close to the sea. The special cause of disease, in this instance, is that opposite the range, and a few yards from the room doors, there is a wall to screen the doors. The result is that this wall and the officers' quarters obstruct the free passage of the air about the rooms. But, besides this, the casemates have no through ventilation. The officers' quarters have also a wall behind them which keeps the breeze from the rooms. Both rooms and casemates are supplied with comparatively still air. The men in the casemates suffer from fever, and the officers' quarters are stated to be far from healthy.

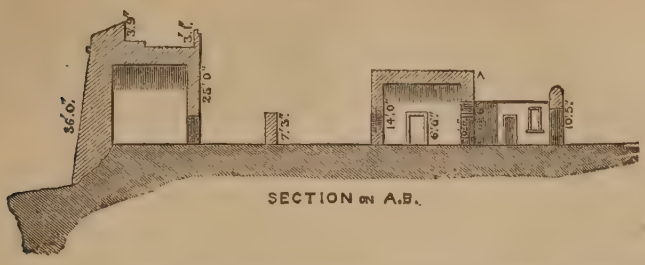
This error in construction is shown in plan and section in Fig. 20.

The obstructing wall might be removed with advantage to the ventilation. Another example of the same defect is afforded by Fort St. Angelo barracks, Fig. 10.

Fig. 20.—Fort Ricasoli.—Plan and Section of part of Barracks, &c.

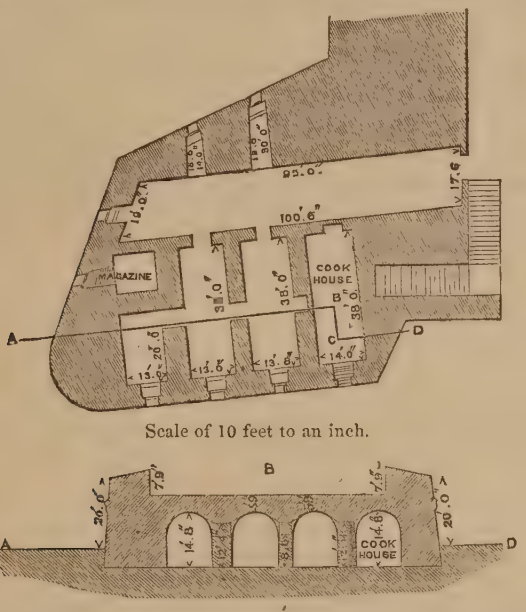


2.




Fort Manoel contains 23 occupied casemates not built on a healthy model; but the largest of them, although by no means of good construction, affords an illustration of the main principle of ventilation applicable to this class of structures in Malta. The rooms in this casemate are a third of their height below the level of the ground. They are very complicated in structure, but as will be seen by referring to Fig. 21, they have doors or windows on all the four sides, so that they have the advantage of every air current outside. We found the air moving in every part of this large complicated casemate, and the atmosphere was comparatively fresh, although there were many men in the rooms at the time.

Fig. 21.—Fort Manoel.—Plan and Section of Soldiers' Quarters, No. 1, for 66 Men.




Scale of 10 feet to an inch.

The position of the windows is the only favourable point in this construction, and is our only reason for describing it.

By a careful adaptation of the principles we have laid down in the preceding pages and in Plans X. and XI., most of the barrack rooms in Malta may be sufficiently ventilated; but every case must be considered by itself, and returned upon until the rooms are found to be fresh inside by night as well as by day. There should be no draughts in a properly ventilated room; if the men complain of any it is because the work has not been well done.

## 6.—Space per Man in Barrack Rooms.

In permanent barracks at home stations the space per man is fixed at 600 cubic feet by regulation. This unit can be adopted with perfect safety, because the barrack rooms at home are only of limited height, rarely exceeding 10 feet, and the cubic contents permit of the beds being sufficiently spread over the floor to prevent material surface overcrowding. Constructed as our home barracks are, 600 cubic feet per man is therefore a convenient form for expressing the amount of space and area each man ought to have.

But if we were to double the height of the rooms, leaving the cubic space as before, we should have great surface overcrowding.

In home barracks, 600 cubic feet means about 60 square feet per man, which, with good ventilation, is enough for health in England. But in warm climates, and especially in close, badly ventilated localities, a much larger extent of surface is requisite. Keeping these principles in view we shall be better able to estimate the relation which the question of space bears, as regards health, to the other conditions arising out of locality, construction, and external ventilation, which we have described.

A Maltese barrack usually consists of a number of arches built side by side like a small viaduct; one end, or the back of the room being closed by a wall, with or without loopholes. The other end, or front, is also built up except the space for the door and window. The beds are arranged in two rows, with their heads to the piers of the arches. The height of the piers is generally from 8 to 10 feet, but in some cases it is 14 or 15 feet, and the arch rises 6, 8, or more feet higher.

The total height of the room to the top of the arch varies from about 14 feet to 16, 18, 20, 25, or 26 feet, or even more. We have given in the barrack reports the detailed measurement of every barrack room; and it will be evident, by referring to the data, that for these barracks the question of cubic space in relation to health, is merged into the question of superficial area per bed. If the same construction of barrack existed at home, it would be no longer possible to limit the space to 600 cubic feet per man, simply because the beds would be too close together, and it is impracticable to preserve health in a barrack room where this is the case.

In many of the Maltese barrack rooms the beds are as close together along the wall as they can be placed to leave any space between them. In Lower St. Elmo barrack the wall-space per bed is $4\frac{1}{2}$ feet, the bed being 3 feet broad, so that there is only about $1\frac{1}{2}$ feet between the beds. In Floriana barrack the wall-space is about $3\frac{1}{2}$ feet only; in Ricasoli it is from $3\frac{1}{2}$ to 4 feet; in Verdala barrack it is 4 feet 9 inches. In one 44-men room in St. Francis Floriana, the beds, if arranged along the walls, would touch each other.

The cubic space per bed, is, it is true, considerably larger on an average than that which has hitherto been allowed in home barracks, but the increase of space is all above the beds. We have thrown the results of this part of the inquiry into Table No. 23 in the Appendix, which shows the number of men in each barrack for every 50 cubic feet from 250 to 800 feet and upwards, as also the number of men in each barrack for every five feet of superficial area from 25 square feet to 70 square feet and upwards. The following abstract shows the results for the whole garrison.

Cubic Feet.

| 250 to 300 | 400 to 450 | 450 to 500 | 500 to 550 | 550 to 600 | 600 to 650 | 650 to 700 | 700 to 750 | 750 to 800 | Above 800. |
|---|---|---|---|---|---|---|---|---|---|
| No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. |
| 60 | 349 | 829 | 530 | 1,076 | 927 | 754 | 703 | 112 | 331 |

Superficial Feet.

| 25 to 30 | 30 to 35 | 35 to 40 | 40 to 45 | 45 to 50 | 50 to 55 | 55 to 60 | 60 to 65 | 65 to 70 | Above 70. |
|---|---|---|---|---|---|---|---|---|---|
| No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. |
| 127 | 385 | 709 | 2,429 | 979 | 458 | 270 | 44 | 58 | 148 |

This table shows that half the troops in garrison have less than 600 cubic feet per man, the amount fixed by the Royal Commission as indispensably necessary for health on home stations; but, what is of far more importance, it shows that the surface overcrowding in the great majority of barrack rooms is excessive. A fourth of the troops have less than 40 square feet per man. The whole garrison, except two and a half companies, have a smaller superficial area than would be deemed sufficient at home; and 150 men only have space enough for health.

We have in a preceding table given the accommodation in each barrack in contrast with the number of men the rooms ought to contain, with due regard for health, and to the local position of the barrack. The following are the totals of this table for the garrison.

| Present Regulation Number of Men. | Proposed Number of Men. | Deficiency of Accommodation in Men. |
|---|---|---|
| 6,955 | 5,014 | 1,941 |

It appears, therefore, that to keep up the present strength of 6,955 men, it will be necessary to find barrack accommodation for 1,941 men.

In such a climate and in so confined a garrison as that within the lines at Malta the superficial area per bed should not be less than from 60 to 70 square feet, and in calculating the accommodation we have kept as near as possible to the smaller of these areas.

Our inquiry then has led us to the conclusion that the barracks in garrison are very much overcrowded; and that they are consequently very defective as regards ventilation. Nearly all of them smell close and musty in the daytime when the men are out; and it seems as if the stone-work were saturated with foul air. The conclusion has forced itself upon us that there is quite enough in these insalubrious conditions, when combined with closeness of locality, and sometimes with dampness, to account for the fever from which the troops suffer, and also for much of the predisposition to chest disease which prevails. The conditions are in truth very much the same as those which have existed in barracks at home, aggravated in Malta by local peculiarities as to position, by casemated construction, and by higher temperature.

The removal of overcrowding resolves itself into providing additional barrack accommodation for 1,941 men, and the question is how this is to be done. We shall presently describe the state of the hospitals, and we shall show how unfit they are for sick. We shall propose to build proper hospitals, and if this course be taken the existing hospitals may at a moderate outlay be made to accommodate 1,000 men. There are no married soldiers' quarters, and it is a matter of urgent necessity that such quarters should be built. These will hold about 400 men, and, together with the hospital buildings, they will reduce the number for whom new barrack accommodation will have to be built to about 500 men. There are several convenient sites where this additional accommodation might be placed. A barrack for 112 men could be conveniently built for Fort Ricasoli; another for 59 at Fort Manoel; another for 38 at Fort St. Angelo. The remainder should be provided for in situations where additional room space is required.

Wherever new barrack rooms are to be built the site should be open, and the buildings should be freely exposed to the northerly winds. The new constructions should be so placed as not to interfere injuriously with the external ventilation of existing barracks. They should be planned on the principles already laid down in the preceding pages of this report, and shown in Plans I., II., and III.

At Malta the walls of inhabited rooms should be built hollow for coolness and dryness. Verandahs are not essential, but are convenient for communication in the hot and wet seasons.

## 7.—Drainage.

All the barracks are drained into the harbours or sea, except the small gate barracks on the Cotonera lines, which, from want of outlet, are drained into cesspits. The drains are cut out of the porous sandstone rock, in the same manner as the town drains are, and are of dimensions quite disproportionate to the amount of fluid they have to carry away. For instance, the small barrack of St. Francis Floriana, which affords accommodation for 333 non-commissioned officers and men, is drained by a sewer 5 feet deep and 2 feet wide.

The new Verdala barrack, with about double the accommodation, is drained by two main sewers, the largest of which is no less than 10 feet deep and 2 feet wide. It is quite impossible to ensure safety to health with such immense sewers. The water-supply during the wet months of the year cannot keep such sewers clean; and in the hot months when there is no rain there is a mere driblet of water, and they become cesspits generating foul air.

The faults in size and construction are the same as those already noticed in reference to the town sewers, and they lead to similar results, giving rise to nuisance in certain states of the wind, and to saturation of the porous sandstone subsoil with sewage matter, and foul air.

In several instances the sewers are very imperfectly known, and appear never to have been examined and registered. This is the case with those for draining Upper and Lower St. Elmo. The drainage of the latter barrack is very bad. The sewers appear to be only long cesspools; and the ground is so saturated with foul matter, that the outbreak of fever already mentioned, which extended even to Upper St. Elmo barracks, overhanging those of Lower St. Elmo, was attributed by Inspector-General Forrest to the ground having been opened to lay down gas-pipes. The drainage of Upper St. Elmo, and of the military prison, is carried into Lower St. Elmo sewers, and these, from their low level, do not discharge themselves, so that the cesspits connected with them have to be emptied by

hand once a week. This state of the drainage is most dangerous, and requires immediate remedy.

The outlet of the drainage at Fort Ricasoli gives rise to great nuisance on account of the foul matter spreading over the rock before passing into the water. A result of this is that smell is experienced in the nearest barrack room, which, although the most exposed to the sea breeze, is not so healthy as it ought to be from its position.

The parade grounds are drained for removing surface water, and the drains are trapped. Sometimes the traps become choked after dry weather, and the rain-fall lies on the surface. Not unfrequently the paving and guttering are in a bad state, especially the latter. At Floriana barracks we found foul water lying in a long open drain before the doors of the casemates, a nuisance which even in this climate could not be permitted with impunity.

At the smaller gate barracks, such as Zabbar gate, the refuse water is carried away by hand and thrown on the ground. The privies of these barracks are over cesspits, and one of them, at Polverista gate, gives rise to considerable nuisance on the public highway during summer, but especially during the operation of cleansing.

The whole system of drainage connected with the barracks requires examination and revision. Every drain and sewer should be ascertained, and its details described, mapped, and figured. Glazed drain-pipes carefully laid, and with water-tight joints, should be substituted for the present large porous sewers, which should be cleansed and filled up. The sewers should be trapped where they join the town mains; and they should be ventilated by pipes carried above the highest part of the barrack, the upper end of the tube being covered by a box of powdered charcoal to destroy the gas. Where there are latrines placed at the higher end of the sewer, they will ensure its whole line being flushed out daily; but where there are drains into which filth is liable to be thrown, without water to carry it away, provision should be made for discharging water into the upper end of the sewer to sweep it clean from deposit. When barracks have a separate drainage outlet it should be carried into deep water by means of an iron pipe in the manner already recommended for the town drainage. Care should be taken that the pipe is sufficiently large to remove easily any amount of drainage likely to pass through it, and the end should be laid to prevent the waves being forced up the sewer during heavy seas.

### 8.—Water-supply.

The sources of water for the barracks are the same as those for the towns, viz., rain-fall and the aqueducts.

Every barrack has one or more large tanks dug in the rock. The total capacity of those of military buildings is 12,500,000 gallons. Water for filling them is collected from all the available extent of roof, and from the works; and most of them have a connexion with the aqueducts, by which they can be filled. The aqueducts, which supply a large part of the water required, would of course be cut across in case of siege, and the garrison would have to rely on the rain-fall entirely. If the tanks were all full, they would afford 6 gallons of water per man per day for 11 months for a garrison of 6,000 men. In some cases, at present, the water falls short; and the quantity required even for the most needful purposes has to be carried by fatigue parties. This was the case at Verdala barracks, also at Fort Ricasoli, where two of the tanks were leaky, and water had to be brought by the Commissariat, and stored in open wooden barrels on the parade ground, where it soon becomes warm and unfit for drinking.

The stored rain-water, if kept free from impurities by being passed into the tanks through filters periodically cleansed, and by proper care being taken to allow all the roofs, &c., to get thoroughly washed by the first rains before the storing is commenced, will of course be nearly as pure as the rain itself. As drawn from the tank, this water is found to contain a small quantity of saline matter, chiefly chlorides, arising partly from salt water being carried into the air by high winds during the rainy season, and partly from spray falling on the roofs, &c. of the more exposed barracks, and leaving a deposit of salt. The aqueduct water is stated to contain a small quantity of sulphates, besides chlorides. Both waters appear to be clear and good; but the tanks are liable to several disadvantages. First there is often a large quantity of ova of musquitoes and other insects diffused through the water, a nuisance for the destruction of which the natives are in the habit of keeping eels in the tanks. Secondly, towards the end of the dry season the tank water is apt to become impure from the deposit at the bottom. We have seen such water so muddy as to be quite unfit for use. The remedy for both evils is careful periodical cleansing of the tanks at the end of the dry season, and filtration of the water of each barrack, on one general system, both before it enters the tank and before it is used for drinking. The ordinary Malta filtering-stone does not answer. It is slow in its

operation, and is too convenient a vessel for depositing filth in to be safe. In one case we found a filter half full of oyster shells, and of course disused. Another serious disadvantage arises from the fact that some tanks are too close to the sea level and derive saline impurities from this source.

A water inspector should be appointed whose sole duty it should be to attend to the water supply of all barracks and hospitals; to see that this is kept in a wholesome state; that tanks and water filters are properly cleaned and in good repair, and that they are freed from all sources of impurity. A downward and upward filter, as shown in Figs. 1 and 2, forms a simple and efficient arrangement for filtering water before it enters the tank.

Water is generally raised from the tanks by a rope and bucket slung over a pulley. In some barracks there are hand pumps. Every tank should be provided with a pump, and one or more cisterns to be filled by the pump should be placed in convenient situations, for the water to be laid on from them, for all purposes. A bucket is a very objectionable method of raising water, as it stirs up the impurities at the bottom of the tank, and requires a large open hole to be kept in the top of the tank, through which extraneous filth is very liable to gain admission.

There is no such thing as a constant water supply for either barracks or hospitals, and, as one result, all the purposes for which water is used, ablution, cooking, latrines, &c., are carried out in these permanent barracks on the same principle as if the garrison were an army in the field. It is quite necessary that the means of distribution should be brought more into conformity with modern usages, not only for convenience, but for health. Every barrack should have water laid on constantly for all purposes, such as ablution, bathing, cooking, drinking, and supplying latrines. Without it proper cleanliness can never be carried out. Every barrack should also have drinking water constantly at hand at all convenient points. In such a climate this great convenience is even more necessary than at home. Filtration, on the plan recommended above, should be carried out at the same time.

If improved means of distribution by distributing reservoirs and by laying down water pipes were introduced, the present daily amount of water delivered to Valetta by the aqueduct (about 9 gallons a head per day) would be more than enough for all purposes of the garrison and civil population, but the water supply on the Cotonera side of the harbour would certainly not be sufficient. Under the present arrangements for distribution, and the waste incurred by it, it is very doubtful whether sufficient fresh water could be spared for the latrines, after the additional amount required for ablution rooms and baths has been provided. Should it be found on trial that there is a deficiency, it will be requisite to use sea or brackish water for the latrines. The latter could be obtained from wells sunk near the sea shore. This water would have to be raised by manual labour, or by a small windmill at each barrack where it was required, into a cistern containing two or three days' supply at the rate of at least $1\frac{1}{2}$ gallons of water per man per day. This method would be applicable to Fort St. Angelo, Fort Ricasoli, and Fort Manoel. But the wiser plan would be to improve the fresh water supply from the aqueducts, both in Valetta and Cotonera, first by improving the method of distribution as suggested, secondly by increasing the amount of water obtained from the sources, if necessary. The improvements in water supply we have recommended are indispensable for enabling the sanitary condition of the civil population to be ameliorated, and they would include the barracks also.

### 9.—Ablution and Bath Accommodation.

The means of personal cleanliness throughout the garrison are very deficient, and require entire reconstruction. In a warm climate any means of washing will not answer; there must be certain facilities and inducements to cleanliness held out to the men, and, unless they are supplied with these, no supervision will ever keep them clean.

In four barracks—Fort Manoel, Fort Tigné, St. Elena gate, and St. Francesco di Paola, there is no ablution or bath accommodation. At St. Elena gate the men wash in the public street before the barracks, if they do not wash in the rooms. At Fort Ricasoli the ablution accommodation is very imperfect, and practically of little use. At Upper St. Elmo the only water laid on to the ablution bench is salt water. Soft water has to be carried by hand. There is an ablution shed at Floriana barracks so placed as to obstruct still further the ventilation of the passage form which the air enters the barrack rooms. At Isola gate water for ablution has to be carried 50 yards to an open shed. Lower St. Elmo is the only barrack in which water is laid on, from the circumstance of its being below the level of a large excavated tank close at hand; but whenever the water in the

tank is drawn off to a certain depth, the ablution benches are left without water, and it then has to be carried by hand.

The ablution accommodation in barracks provided with it is either a lean-to shed or a casemate. There are stone benches along the walls, sometimes hollowed out into troughs. The usual iron basins are provided for washing. There is generally a drain in the floor, into which the foul water is poured. The porous nature of the stone keeps the ablution room constantly soaked with wet. The rooms are generally deficient in gratings and pegs. There are no baths; but, as all the barracks are close to the sea, there are bathing parades, except during winter. Sea-water bathing is not sufficient for the purposes of cleanliness, and were it possible to provide a sufficiency of fresh water, it would be most advisable to construct baths. If this cannot be done, it might be worth while to make a trial of a few baths with salt water, and to issue marine soap. The consequence of the present deficient means of cleanliness is, that the same water is not unfrequently used by several men, to avoid the trouble of carrying from a distant pump; and it is suspected that the spread of ophthalmia is in some measure due to this practice.

We have no hesitation in recommending an entire reconstruction of the ablution accommodation. There is no objection to sheds, provided they be large enough and enclosed, nor to casemates if properly lighted, ventilated, and fitted up. There should be at least one basin to every ten men which the barrack will contain; and instead of the present moveable basins and a large mass of wet stone-work on which they are placed, we would advise the introduction of a constant supply of water from a raised tank, and the adoption of slate slabs with strong white earthenware basins sunk into them. These basins should each have a valve discharging apparatus. The water supply cock should be sufficiently large to fill the basin rapidly, otherwise the men will fix it open; and the cock should be weighted to close of itself. Fixed foot-pans, similarly supplied with water, should be introduced into all the ablution rooms. These improved ablution arrangements are shown on Plans XV., XVI., and XVII.

### 10.—Cook-houses.

All the barracks are provided with cook-houses; they are generally in casemates, and, with few exceptions, are very deficient in light, and especially in ventilation; some of them indeed are so hot that it is almost impossible to remain in them. Generally the only light and ventilation is from the doorway, or from an opening above the door.

They are provided with the usual barrack boilers, and ovens have recently been introduced into some of them; but these have been constructed so as to consume too large an amount of fuel, and the men do not use them. The improved steel ovens and boilers, Plan XVIII., should be introduced without delay in every cook-house. The saving in fuel which would result would repay the cost of the change in a short time. In order to prevent mistakes, we would recommend that the first boilers and oven sent out should be in charge of Mr. Roberts, C.W., who is practically conversant with the manner of setting them. Mistakes in setting have occasioned failures at home.

To increase the ventilation openings should be made wherever an air-current can be obtained, and shafts should be carried up through the roofs. The cook-houses should have ample ventilation and plenty of light. They should be provided with a place for coal, to be filled from the outside, and a sink. Water should be laid on to the boilers and to the sink. A long table should be placed across the room, on which the dinner should be served, and this table should be so arranged as to separate the men who come to carry away the dinner from the rest of the kitchen. A table is better than a counter, because it would allow any dirt underneath to be seen, and the cook-house to be more easily cleaned.

An improved cook-house of this description is shown in Plan XIX.

### 11.—Women's Wash Houses.

The accommodation for washing barrack linen is very deficient. In several barracks there are no wash-houses.

Where they exist they are in casemates or in open sheds. They are seldom furnished with boilers; there are instead small open fireplaces, over which the linen is boiled in small pans. There are no fixed washing conveniences. Usually there are benches for moveable tubs, but no proper drainage, and no water laid on.

Generally the means of providing clean linen are as defective as the means of personal cleanliness.

Wash-houses in which the women could wash and iron clothes should be provided at such places as appear most convenient. The building should contain two rooms, both

amply lighted, and ventilated by louvres in the roof. One room should be fitted up as a wash-house, the other as an ironing room. The wash-house should have fixed tubs with cold water laid on from a raised cistern; the best source of supply for which would be the rain water tanks on account of the greater softness of the water. Boilers in which the clothes could be boiled or from which hot water could be procured should be supplied in the proportion of one boiler to about four tubs. The tubs should be emptied through the bottoms into an open drain arranged to carry off the water rapidly and directly away from the wash-house. An open drain is easily kept clean, and is not liable to be stopped up. The floor should be flagged and wooden gratings provided. The wash-house should be furnished with a coal box placed in a recess.

In the climate of Malta a drying stove would be unnecessary. The ironing room should have plenty of light round the three sides not adjacent to the wash-house, and a table not less than 2 feet 6 inches broad, all round, for ironing. *See* Plan IX.

## 12.—Latrines and Urinals.

Except two or three of the gate barracks, all the barracks within the lines are provided with water latrines of a kind commonly used in Malta. They consist of a trough of soft porous stone, the bottom of which has a slope towards an outlet-pipe at the lower end. The opening of the pipe is closed by a ball valve, which, when raised by a lever, discharges the contents into a drain. With few exceptions, water is not laid on to the privies, and the practice is for the men to carry all ablution-water and other slops and to throw them into the trough. Water so supplied affords the only means of flushing or cleansing.

Often there are no seats, except a bar, and no divisions between the seats. In the recently constructed work at St. Peter's lower counterguard there are seats, divisions, and partial doors. The usual position of the privy is in a casemate, without anything like sufficient light or ventilation, and, generally speaking, the places are noisome and unhealthy.

The only good point about them is the adoption in principle of the water latrine, but in every other point they are very defective.

The material used is so porous that the substance of it is completely saturated with filth, and is itself a constant source of nuisance. The water-supply, except in two or three instances, is only of a casual kind, and yet this is one of the points of greatest importance wherever water latrines are in use. The trough should always contain water, and there should be a tank or other supply at hand to allow of the trough being filled and flushed out several times a day, in proportion to the number of men using it, to prevent nuisance.

The kind of seating in use prevents the possibility of cleanliness in the latrine, and the want of divisions and doors is contrary to decency. The most difficult point is how to increase the light and ventilation; but both objects might doubtless be accomplished in most instances by openings through the crown of the arch or in the walls.

Macfarlane's iron latrine, or Jennings' earthenware latrine, Plans XII. and XIII., should be substituted for the present trough, because they are of impervious material, and have combined in their construction the best form of seating, divisions, and doors. Both require a water-supply, and also regular mopping to keep them free of smell. Jennings' latrine exposes less evaporating surface than the other.

We consider these improvements as of primary importance to the sanitary state of barracks in such confined spaces, and where the latrines have to be placed close to, sometimes in contact almost with the men's rooms.

The urinals are porous stone troughs of the ordinary construction, and extremely offensive, especially when placed near the latrines. They have no water-supply, and their material does not admit of sufficient cleansing. Slate or earthenware urinals, on Plans XIII. or XIV., are required for every barrack, and there should be water at hand for daily cleansing.

Urinals for night use, near the barrack-rooms, but in a closet outside the rooms, should be put up wherever it is possible, and urine tubs dispensed with. But many of the rooms are so constructed that it would be very difficult to find places in which to put the urinals with due regard to ventilation. Wherever this can be done, however, night urinals should be introduced. The room or closet in which the night urinal is placed should be completely cut off from the barrack rooms by a lobby with cross ventilation. The closet should be perfectly light, to ensure cleanliness, and abundantly ventilated. The form of urinal may be that recently constructed by Mr. Jennings, as shown in Plan XIV. In our detailed reports on the barracks, we have not recommended these urinals for each barrack specifically, because we have considered it more advisable

to leave the question as to which arrangement to adopt, to the local officers, but we nevertheless are of opinion that night urinals are essential for barrack-rooms.

Or a moveable tub may be adopted on the principle shown in Plan XV.

At the new Pembroke barracks urinals have been placed in a projecting porch behind the barrack room, and completely cut off from the room by a separate ventilation; but they are of unsuitable construction and material. They were formed of soft porous stone; soon saturated with urine, which actually made its way through the wall to the outside. This experience affords practical illustration of the unsuitableness of this material for any purpose of sewerage, drainage, latrines, or urinals.

### 13.—Cleansing.

The barrack yards and premises are in most instances kept clean. But wherever we found the surface paving or guttering imperfect, there was imperfect cleansing more or less as a necessary result. It need scarcely be stated that in such a climate the greatest possible attention should be paid to these matters.

It is the practice in most barracks to collect the barrack refuse in ashpits, often in close confined positions, from which the matters are removed at short intervals by people who contract to do it. There are also stables; and it sometimes happens that while the stable manure is very properly and necessarily removed at once, the barrack refuse in the ashpit is left to accumulate.

Ashpits should not be permitted at any of the barracks. They should be cleansed, filled up a foot above the level, and the space flagged and drained, and iron boxes placed on the flags to receive the refuse. The boxes should be emptied every day into the cart, and no accumulation should be permitted.

The barrack rooms generally appeared to be clean, but there was nevertheless a peculiar odour in the rooms, which showed that the walls were saturated with the exhalations from the breath and bodies of the men. This condition of the walls of dwelling rooms has a well-known effect on the frequency with which fevers and other zymotic diseases occur. These diseases form a large item in the sickness and mortality of the garrison, and it would be highly advisable, as a preventive measure, to scrape the whole interior of the casemates, and all the barracks, at least once in every two years, and to wash the walls, ceilings or arches once in six months with quick-lime.

### 14.—Non-Commissioned Officers' Quarters.

These quarters are generally in casemates, similar to those used for soldiers' quarters. Occasionally, as at Fort St. Elmo, small rooms, some of them built against the rock, are set apart for the purpose, and wherever this is the case there are great complaints made by the inmates of closeness and ill-health. The accommodation consists usually of a single room, having from 1,500 to 2,000, 3,000, or 4,000 cubic feet of contents. The serjeants' rooms at Fort Verdala contain nearly 5,000 cubic feet, the space being the same as that allotted to 10 men in the adjoining barrack rooms.

Serjeants' bunks are in use in several barracks, as for instance in Lower St. Elmo, where there is a bunk without direct light or air in every room of the two inhabited floors of that unhealthy barrack. There are certain difficulties in the way of their removal out of the rooms, for indeed it would be impossible to provide other accommodation; but there is no reason why every bunk should not have a small window to admit light and air.

The ventilation of serjeants' rooms is generally of the same nature as that of the barracks, and should be improved on similar principles. All those built against the rock should be abandoned with as little delay as possible, and ventilated in the meantime.

### 15.—Married Quarters.

There are no specially built quarters for married soldiers. They are generally provided for in rooms not good enough for barrack rooms, or in unoccupied barrack rooms, or in the arches of counterforts or fortini, as is the case at Fort Ricasoli and in the Cotonera lines. There are also a few married people in wooden huts.

The accommodation is of a very inferior and uncomfortable kind. That provided in the fortini and counterforts has been obtained by simply constructing a wall across the arch, leaving space for a door and window. The arches generally are narrow and shallow, and the superficial area of the rooms so obtained is very small. Sometimes the space is added to by placing a floor above; but in this case it is necessary to leave a hole in the floor for the ladder of access, thereby rendering the floor too small for any purpose, and the place so inconvenient that these upper floors are hardly ever used.

We have pleasure in bearing testimony to the cleanliness and neatness of these small uncomfortable dwellings. The soldiers' wives evidently take a pride in making the very best of the accommodation, and much could be done to increase their comfort at a very small cost. To enlarge the accommodation we would recommend that in all cases where there are families two adjacent arches should be given over for a quarter, and a door made through the intervening pier, and that where floors have been introduced they be removed.

But it is absolutely essential that married soldiers' quarters should be built to supply the required proportion of accommodation of this class.

We have already described, and shown on Plan V., the general construction of married quarters for the Mediterranean stations. Fire-places may be omitted at Malta, but a cook-house, similar to the one on Plan V., should be provided in a convenient situation with several broad chimney recesses with raised platforms on which the women may cook.

It is unnecessary to make further provision, because the small Maltese fire-clay stove, which is universally used in Malta, and generally so by the soldiers' wives at the present time, affords sufficient means of cooking.

For each group of quarters an ablution room for men, and one for women and children, similar to Plan VIII., should be provided.

The best arrangement for these quarters for Malta is to place them in a row of the required number of stories in height. Each quarter should be entered from the open air, under a verandah or from a gallery. Sinks for refuse water, and water supply, should be placed in the building allotted for cooking, but should be kept quite away from the living rooms. Each gallery or floor of the living rooms should be supplied with an iron box for the reception of refuse, which should be carefully cleaned out every day.

## 16.—Guard Rooms and Prison Accommodation.

The guard rooms are, with few exceptions, by no means good. Like the barrack accommodation they are in casemates, as near the gates as possible, and, like the barrack rooms, they are generally deficient in light and ventilation, and in some instances very much overcrowded. The amount of space per man depends of course on the number of men on guard; but when there is a full guard there is overcrowding, except in one or two instances. The following table gives a general idea of the space per man allowed:—

| Guard Rooms. | Cubic Contents in Feet. | Number of Men on Guard. | Cubic Feet per Man. |
|---|---|---|---|
| Upper St. Elmo - - - - | 1,733 | 17 | 102 |
| Lower St. Elmo - - - - | 10,091 | 11 | 917 |
| Marsamuscetto - - - - | 6,588 | 12 | 549 |
| St. James' Cavalier - - - | 1,776 | 10 | 177 |
| Floriana - - - - - | 5,252 | 14 | 375 |
| St. Peter's Lower Counterguard - | 9,461 | 4 | 2,365 |
| Fort Tigne - - - - - | 1,862 | 7 | 266 |

This table shows considerable diversity of practice in allotting space in guard rooms, and we would recommend that, as a rule, this space should never be less than that allowed in barracks.

The cell accommodation is mostly of an unsuitable character. The cells are usually casemated, but in two or three instances they are wholly or partially hollowed out of the rock, and are damp in consequence.

Their cubic capacity varies considerably. Sometimes it is apparently more than is required for health; as, for example, at Upper St. Elmo, where the cells have from 2,460 to 3,700 cubic feet; but again, these cells are dark, more or less damp, and not fit for anything except mere temporary occupation. They are not places in which men should undergo sentences. On the other hand, the cells in Lower St. Elmo have a capacity of only 574 cubic feet, or about one half what they ought to have, even if they were good. The cells at Floriana barracks have from 1,500 to 2,000 cubic feet capacity; while the cells at St. Francis barrack, close at hand, have a capacity of only 490 cubic feet, and are badly ventilated besides. The cells at Verdala barrack have less than 800 cubic feet, and those at Fort Manoel give from 550 to 759 cubic feet for each prisoner. These amounts are too small for health in such a climate. There are certain associated cells at Upper St. Elmo, which have to be used for men sent from

the garrison military prison, where there is not sufficient accommodation for the ordinary prisoners. This necessary practice of course renders prison discipline on men undergoing sentences almost impossible.

Taken as a whole, the prison accommodation is deficient. The garrison prison, elsewhere described, affords a very inadequate amount of space, as it only contains 33 cells for a garrison of 6,000 men: the usual allowance being from 1 to 1½ per cent. of the force. It is badly placed, and not healthy, and we are strongly of opinion that a better prison, with sufficient accommodation for the wants of an increasing garrison, should be built on a more healthy site. One of the bastions on the Cotonera lines would afford a convenient position.

For guard-rooms, the arrangement shown on Plan VI. will be found convenient, but the details will of course vary with the extent of accommodation required.

## 17.—Means of Instruction and Recreation.

The means of instruction and recreation at present existing are as follow:—

1. There are a few ball courts.

2. There are schools, usually held in casemated rooms, some of which are not very suitable on account of being too dark and not very healthy. In one or two instances the schools are held in the old catholic chapels of the forts, as at Fort Manoel, where the accommodation is tolerably good. Besides these, two excellent chapel schools have been recently built. We found all the schools deficient in ventilation, and those in casemates deficient in light. The chapel schools, from their construction, can be best ventilated through the ridge and at the eaves. The casemated schools should be ventilated and better lighted, on the same principles as the barrack rooms.

3. Most barracks have a library and reading room, also in casemates. They are lighted at night by oil lamps. During the day there is not light enough, on account of the construction. All require more light and air.

4. There are sometimes garrison races, leaping, quoit-playing, skittle and ball playing, cricketing, boating, &c.

There are no day-rooms, no place in fact to sit in, except the uncomfortable casemates; or, as in the case of Lower St. Elmo, the recreation rooms are in the gloomy, unwholesome, ground floor of the barracks.

There are no cricket or skittle grounds, no workshops, and no gymnasia. Temporary theatres are sometimes erected by the soldiers. There are no soldiers' gardens, but with reference to them, it has been stated to us that the French, during the blockade of the fortress, kept themselves from scurvy by cultivating vegetables in the ditches; showing that gardens can be cultivated.*

The means of recreation are very deficient. There is not sufficient shade, and the men are confined to their barracks during the heat of the day in summer, just at the time when fevers are most prevalent throughout the garrison and among the civil population, and when it is of most importance for the men to have sufficient exercise and fresh air to breathe.

We consider it a matter of urgent necessity that each barrack should have a day room and reading room constructed on the principles laid down in the report on soldiers' day rooms. The rooms should be light and airy and well supplied with comfortable benches with sloped backs arranged along the walls, arm-chairs, and broad solid tables. There should be a small bar for tea and coffee, bread, butter, &c. There should be gymnasia in positions convenient to the principal barracks in which the men could be properly trained. Gymnastics should be made a parade.

## 18.—Recapitulation.

Before proceeding to discuss the hospital question, we shall briefly recapitulate the results of our inquiry as regards the barracks.

1. The most important diseases from which the troops suffer in Malta are fevers, chiefly of the continued and typhoid types, and diseases of the chest, especially tubercular consumption.

2. Except the debilitating effect due to heat, there is nothing in the climate or topography to give rise to these diseases. But there is enough in the present condition of the barrack and hospital accommodation to account for their prevalence.

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* We are glad to learn that since we were at Malta the Governor has set apart two ditches in which to form soldiers' gardens, one near Floriana barracks, the other near Lascaris.

3. Although great improvements have been effected of late years in the sanitary condition of the towns, there is sufficient in the present state of the drainage and in the outlets to occasion impurity of the air in the neighbourhood of some of the barracks.

4. With the exception of Lower St. Elmo, all the barracks are at a sufficient elevation above the sea to ensure good drainage; but the local position of several of them, as regards the surrounding levels, is prejudicial to health, especially where rooms are built against the rock.

5. The local position of nearly all the barracks is very disadvantageous to free external ventilation, from the proximity of high walls or other buildings.

6. The barracks, except the new Pembroke barracks, are all casemates, and all are built of soft sandstone, which absorbs a large quantity of moisture, and, under certain circumstances, gives rise to dampness of the rooms.

7. With few exceptions, the barrack-rooms are deficient in light and ventilation, and many of the rooms are overcrowded, especially as regards the superficial area per bed.

8. The barracks are drained, but the drainage is not of a healthy kind on account of deficient water supply, the disproportionate dimensions of the sewers, and the bad porous material out of which the sewers have been formed.

9. The latrines are constructed of a bad material, and give rise to nuisance and impurity of the air around the barracks. They have generally no seats nor divisions, no doors, no water-supply, except what is carried by hand; and they are generally deficient in light and ventilation. The urinals are bad as regards both construction and material.

10. There are ashpits in close confined situations injurious to the purity of the air.

11. There is no water laid on for any purpose. All water for ablution, cooking, washing, drinking, and for drainage purposes, has to be raised and carried by hand labour. Drinking water is not filtered.

12. The means of personal cleanliness are very deficient.

13. The cook-houses are, with few exceptions, deficient in light and ventilation, and the cooking apparatus is of an inferior kind.

14. There are no proper means of washing soldiers' linen.

15. The married quarters are not sufficient for the requirements of the garrison.

16. Many of the guard rooms are of an inferior description, overcrowded, and deficient in ventilation. The prison and cell accommodation is deficient.

17. There are not sufficient means of recreation.

Considered as a whole, excepting the new Pembroke barrack, there are no good barracks in Malta. There are several, such as Lower St. Elmo, Strada Torre, St. Elena gate, Isola gate, and the lower floor of St. Peter's Lower Counterguard, which are not suited for human habitation, except temporarily; and we would strongly recommend that this view of the subject be taken, and as few men as possible barracked in the worst class of buildings. It is no doubt possible to build comparatively healthy casemates as part of the defences; but this has certainly not been done in Malta, in the majority of the barracks, which, to judge from their position and construction, as indeed we know from other sources, were never intended for occupation in the manner in which they are now occupied. Better accommodation, and on healthier ground, is what is required to preserve the health both of officers and men, and Pembroke barracks afford an excellent precedent, although the accommodation there is not all that could be desired in a sanitary point of view.

We have already stated generally the nature of the improvements in drainage, water-supply, ventilation, and diminution of overcrowding, latrines, ablution accommodation, &c., which we recommend to be carried out. These will materially lessen the existing evils and lead to improved health; but improved barrack accommodation is more required in Malta generally than at any home station.

### 19.—Sanitary Condition of Hospitals.

The hospital accommodation for this large fortress consists of four separate hospitals containing 619 beds, and a sanitarium with 88 beds. In Valetta there is one general, or rather partially consolidated hospital, close to fort St. Elmo, and occupying one of the worst sites in the town. It is mostly cut off from the influence of healthy winds, and exposed chiefly to the sirocco. The outlets of three town sewers are close to it; one of the sewers passes under its centre, and sewer gases make their way freely into different parts of the building. Being at a low level, comparatively, and at the bottom of a slope, the drainage and moisture of the sandstone rock gravitate towards the building, and the air in and about the wards is always more or less impure.

There are two hospitals at Vittoriosa; one of these, called Vittoriosa hospital, is situated on an elevated site, surrounded by a densely peopled neighbourhood. The other consists of two hired houses adjoining each other in a close narrow street in the same neighbourhood, at a much lower level, and near the unhealthy dockyard creek.

Since the establishment of the camp in St. George's bay, another hospital has been opened at Spinola palace at the top of St Julian's bay. It has one or two good rooms, and the situation is healthy. The arrangement of parts is, of course, that usually adopted in private houses, and is not well adapted for a permanent hospital.

The construction of all the hospitals is bad. The General hospital, Valetta, although it has spacious and lofty wards, is gloomy and badly ventilated. It has small narrow windows close to the eaves, through which it is hardly possible for the sick to see the sky. It is deficient in all structural arrangements for health and administration, and they cannot be supplied without a large outlay. Healthy winds can never, from its position, sweep through the building. John Howard, who visited this hospital in 1786, states that "slow hospital fever" prevailed in it, partly due, no doubt, to the wretched administration of the period. Since it came into British possession it has been a continual source of complaint for many years on the part of army medical officers; and, although it can be improved in some respects, it will always be more costly for sick, than would be the cost of a new building in a better position.

The upper wards of Vittoriosa hospital have a better exposure for health than those of Valetta hospital, which to a certain extent neutralizes the radical defects of their construction. But the lower floor wards, which are constructed like the cells of a prison, and also the wards in the cavalier, with their immensely thick walls and narrow loopholes for windows, are quite unfit for sick people. The whole establishment, however suitable for its original purpose as an armoury, is most unsuitable for a hospital.

The amount of space and superficial area allotted per bed in these hospitals varies in a very remarkable degree. This is shown in table, Appendix No. 24, of which the following is an abstract.

Cubic Feet.

| 400 to 500 | 500 to 600 | 700 to 800 | 800 to 900 | 900 to 1,000 | 1,000 to 1,100 | 1,100 to 1,200 | 1,200 to 1,300 | 1,400 to 1,500 | 1,500 to 1,600 | 1,600 to 1,800 | 1,800 to 2,000 | 2,000 to 3,000 | 3,000 to 4,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. |
| 4 | 26 | 45 | 22 | 77 | 42 | 90 | 6 | 9 | 47 | 31 | 10 | 114 | 96 |

Superficial Feet.

| 30 to 40 | 40 to 60 | 60 to 80 | 80 to 100 | 100 to 120 | Above 120 |
|---|---|---|---|---|---|
| No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. | No. of Beds. |
| 41 | 39 | 203 | 198 | 130 | 8 |

This table shows that half the whole number of beds have less cubic space than is required for a warm climate (1,500 cubic feet), and very nearly half have no more space than is required in cold climates (1,200 cubic feet) as laid down by the Royal Commission on the sanitary state of the army, and embodied in the new medical regulations. More than half the beds have a less superficial area than is necessary for health, considering the local position and construction of the hospitals. Hence the element of overcrowding exists in some part of all the hospitals.

The proper space for a sick man in such a climate as that of Malta is 1,500 cubic, and 100 superficial feet.

*Ventilation.*—The ventilation of the hospitals in Valetta and Vittoriosa is as defective as it is in most of the barracks, and should be improved on the same general principles as those laid down for barracks. The ventilation of Spinola hospital is better from its open position.

*Drainage.*—The drainage of the Valetta and Vittoriosa hospitals is bad, and gives rise at times to serious nuisance. It requires to be examined and improved by laying down pipe drains, and by filling up the present large sewers.

The town sewers, which pass close to and under the General hospital, require relaying; and their outlets should be carried by iron pipes into deep water in the manner already mentioned.

*Water-supply.*—Water is obtained from rain-water tanks, and partly from the aqueduct. It is sufficient in quantity and is said to be good in quality, but it is not laid on as it ought to be for all hospital purposes.

*Ablution and Bathing Accommodation.*—This was undergoing improvement at the General hospital at the time of our inspection; but after the additional baths are provided, they will be dark and damp, besides being too far removed from a considerable part of the patients. There is no ablution or bathing accommodation connected with the wards of any of the hospitals.

There ought to be small rooms close to the wards, having fixed wash-hand basins, with baths, and hot and cold water laid on. It is only by holding out such facilities and inducements to cleanliness that sick men can be kept clean.

*Cook-houses.*—The cooking arrangements are, on the whole, sufficient, but the accommodation generally is not what it ought to be. The cook-houses are on the ground floor, and are darker than is consistent with good management or cleanliness. They partake in short, of the defects of the hospitals.

*Waterclosets.*—There are none. At some distance from the sick wards, and on different floors, as regards some wards, there are the usually offensive Maltese latrines of porous stone, such as exist in the barracks. The whole of the existing system of latrines should be removed. Proper waterclosets are required in proximity to the sick wards in small rooms separately lighted and ventilated, and divided from the wards by ventilated lobbies.

Latrines required away from the wards for convalescents or attendants should be of Macfarlane's or Jennings' construction.

*Serjeants' and Orderlies' Rooms.*—None of the wards have any rooms or sculleries attached to them. There is no possibility of keeping a due oversight of the sick, or of the serjeant or orderly being always at hand night and day, unless he sleeps in the ward. This practice of orderlies sleeping among sick is quite inadmissible, although it is carried out from sheer necessity. Generally, the hospital serjeant sleeps quite away from the proper sphere of his duties.

*Exercising Ground for Convalescents.*—Spinola hospital is the only one where convalescents can get proper exercise in the open air. The only place for the purpose at the General hospital is a sunk court, where the air is stagnant and more or less foul from the bad state of the drainage. At Vittoriosa there is no place for exercising convalescents, except the flat roof of the hospital; a very dangerous place on account of there being no parapet.

It is quite unnecessary to say more to prove the unsatisfactory state of the hospitals within the garrison. Men at all seriously ill linger long in hospital, and the experience of this result, together with representations made on the subject, have led to the establishment of the sanitarium at Citta Vecchia, which is neither more nor less than a defensive measure against the hospitals. Men are taken slightly ill in barracks, they are sent to hospital, where they get worse, and then they are sent to Citta Vecchia, where they improve. Spinola hospital was established partly as a sanitarium, and thus two additional establishments have been called into existence, and now there are five hospitals doing the work for the sick within the lines which could be done by one good general hospital erected in an airy, healthy position, or at most by one general hospital and a small hospital for the Cotonera side.

Spinola hospital, it is true, was partly intended for receiving sick from Pembroke barracks; but while we were in it the cases had, with very few exceptions, been received from Valetta. It was perfectly right that such should be the case, for we feel assured that no medical officer would willingly attempt to treat sick in the hospitals within the lines if he had the opportunity of sending them away.

Even in the Naval hospital, which is in every respect so greatly superior to the military hospitals, we were told of cases, especially of fever, which lingered there, but which would have recovered rapidly if sent to Citta Vecchia.

With the evidence before us we cannot do otherwise than express a very unfavourable opinion of the present hospitals. The Vittoriosa hospital might be extended and improved to render it sufficient for temporary use on the Cotonera side, if it could be done at a less cost than providing a new hospital there, but it would never be a good hospital on account of radical defects in its structure. It might, however, be made large enough to accommodate the sick in the present hired hospital, which should be given up. As regards the General hospital at Valetta, it will never be other than a bad hospital whatever is done with it. No doubt the windows can be enlarged, the ventilation

improved, room for administration, baths, lavatories, and water-closets can be constructed for each ward, and all buildings thrown down which interfere with the external ventilation, but the cost would be very considerable and incommensurate with the advantages, for the primary evil of a bad local position would remain and cases would still require to be sent to the sanitaria for recovery. With this general remark we arrive at the most important point of the whole hospital inquiry—viz., considering all the difficulties of the case, what is the best course to take?

Three methods of dealing with this question have been brought before us.

First. It has been proposed to make a few improvements in the ventilation and drainage of the existing hospitals, adding such parts as may be required, and removing useless buildings, and to continue the present hospitals.

We have said enough to dispose of this alternative already. Only we are of opinion that, as whatever steps may be taken for providing suitable hospital accommodation will require much time, these improvements should be carried out, because the present hospitals must be used in the interval.

Secondly. It was proposed two or three years ago at Malta, to build a general hospital for 300 beds; a site was examined, and plans were sent home for approval. Neither site nor plan were considered sufficiently good. A new site was pointed out on St. Michael's bastion, 169 feet above the quarantine harbour, and freely exposed to all the cool and healthy winds.

Plans were prepared for erecting a general hospital containing every modern improvement by direction of the late Lord Herbert, and approved of by him and by the Barrack and Hospital Improvement Commission of which he was then president; but after everything was ready for proceeding with them, the military authorities on the spot considered that it would be more advantageous to the public service to build new barracks at the rifle practice ground, St. George's Bay. The sick have suffered from this decision, but on the other hand the whole garrison, at the rate of 1,000 men at a time, have now the advantage of being withdrawn from unhealthy casemates to one of the healthiest spots on the island, and their average standard of health will be raised by the change.

Another form of the proposal was to erect one general hospital in as central a position and on as healthy a site as could be obtained outside the lines, to consolidate the entire hospital administration, and to connect the hospital with all the barracks by a service of ambulances.

Third. The sanitarium at Citta Vecchia has been so successful that the Governor is of opinion that the accommodation should be extended to the dimensions of a general hospital for the garrison, the sick to be brought in ambulances from all the barracks, and the medical officers by suitable means of conveyance.

It will be necessary for us to examine this proposal in detail, referring for a description of the building to our report on it.

The position of the Grand Master's "palace of justice," now occupied as a sanitarium, is a very fine and commanding one, about 600 feet above the level of the sea, and exposed to every breath of wind. The situation is much cooler and far more healthy than that at Valetta, and so far as experience has gone, cases of disease, especially fevers, recover well at Citta Vecchia. Convalescences are also rapid, but the climate is believed to be not so well suited for chest diseases brought from the hot close districts about the garrison.

The distance of the sanitarium from the most remote barracks is from $6\frac{1}{2}$ to $7\frac{1}{2}$ miles. The main roads are good, and on the whole the means of communication are sufficient. There appears to have been no practical difficulty in removing the sick, for while we were at Malta a proposal was under consideration for occupying the sanitarium by fever cases from all parts of the garrison. This is a point of much importance in the discussion, because it disposes of the question of the possibility of removing convalescent cases, at least, in the affirmative, and proves that there is great benefit in sending these cases out of the garrison, even to such a distance; but the space within the palace is only a small part of what would be required if it were to be converted into a general hospital for the whole garrison.

The present accommodation in the building consists of 18 rooms, containing 88 beds, with from 1,625 to 1,800, 2,500, up to nearly 3,500 cubic feet per bed. The rooms on the principal floor are very lofty, and vary from 21 to 32 feet in height. The floor space per bed is generally above 100 superficial feet, and is ample for every purpose. This hospital indeed affords the first instance we have met with in which the great importance of the element of superficial area has been recognized. We have no doubt whatever that the place has been of great use to the sick, and if all the sick are to

have the benefit of such a change, we must inquire what the capabilities of the building are for being extended to receive the number of beds required for the force.

The present hospitals contain 619 beds in addition to the 88 at Citta Vecchia. We do not consider this latter number admits of being materially increased in the present rooms. It is true that 100 superficial feet would be quite enough for each bed, but on the other hand some of the small low roofed upper-floor rooms are not very good and should not be used under ordinary circumstances.

If we assume the capacity of the building at 100 beds, it would be necessary to extend it to afford space for 600 additional beds to make up the present hospital accommodation. But it is very probable that the beds *constantly occupied* would be very much reduced in number if all the sick were taken to Citta Vecchia, on account of more rapid recoveries. It is probable that 500 beds in all would be sufficient for every purpose, and hence an addition to the present building, capable of containing 400 beds at 1,500 cubic feet and 100 superficial feet per bed would meet the requirements of the case. 40,000 superficial feet of flooring with wards 15 feet high, besides the area required for serjeants' and orderlies' rooms, sculleries, baths, and water-closets, would have to be found in the neighbourhood of the present building. It is quite certain that no such amount of space could be obtained by any re-arrangement of the interior of the palace. Two or, at most, three good wards could be built above the present wards, but the whole of the space beyond this would have to be found by adapting other houses in the vicinity, or by erecting additions. There is a long narrow building, the front of which is in the same line as the front of the palace, but it is cut up into a number of small badly lighted rooms, which mostly look into close courts or narrow streets. This building in its present condition is quite unsuited for any hospital purpose, and any wards formed out of it would have to be built on its walls. By doing this perhaps two floors of wards might be obtained. But the area for wards, including that of the small piazza between the hospital and the building in question would fall far short of what is required; there would still be a deficiency of space for above 200 beds, on the most favourable supposition. A bastion adjoins one end of the palace on which an additional ward might be erected, but to do this would be to deprive convalescents of their only exercising ground.

We have not adverted to the cost of these alterations, because, in truth, the changes required simply amount to building a hospital for the additional number of beds on a site of a very irregular and circumscribed character, 7 miles from Valetta, and half the buildings when completed would not possess that simplicity of construction so desirable in a hospital.

We are of opinion that the present buildings at Citta Vecchia are very well adapted for the recovery of convalescent cases, which are more easily removed to a distance of 7 miles than are sick; besides requiring less constant care and attention; but considering the distance, and more particularly the great difficulty and cost, if not the impossibility of extending the buildings at Citta Vecchia in a suitable manner, we cannot recommend a general hospital for the whole garrison to be provided there.

After a careful consideration of the whole hospital question we have arrived at the following conclusions:—

1. That it is absolutely necessary to build a new hospital at Valetta for the sick of that part of the garrison, in place of the present very objectionable structure. That there is sufficient space on St. Michael's bastion, the best and most healthy site within the garrison, on which to erect a hospital for not more than 300 beds, with every sanitary improvement. We append Plans and a description of the proposed hospital; and we beg to recommend that it be built. (Plans XXVIII., XXIX., XXX., and XXXI.)

2. That the present hospital at Vittoriosa is not adapted for sick; that the hired hospital is an altogether objectionable building for its purpose, and we recommend that instead of these a new hospital for 136 beds be built on an enclosed space on the new fort, Cotonera, on Plans XXVIII. and XXXII., as an auxiliary to the General hospital, Valetta.

3. That Spinola hospital be in the meantime retained for the use of sick from Pembroke barracks, St. George's Bay, and that the sanitarium at Citta Vecchia be also retained for convalescent cases, at least for the present.

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In discussing the question of additional barrack accommodation we have referred to the amount of space which would be available in the present hospitals if the sick were removed out of them. By converting the wards into good barrack rooms the hospital improvements we have recommended might be made subservient to the extension of

barrack accommodation. The General Hospital, Valetta, and Vittoriosa hospital, although by no means good enough for sick men, could nevertheless be converted into much better barrack accommodation, at a moderate outlay, than that afforded by the casemates. Both hospitals are substantial buildings, and one of them, the General Hospital, contains a very large amount of cubic space quite useless at present, but which could be rendered available by dividing the larger wards into two floors, and introducing the necessary doors and windows. Five of the larger wards are 30½ feet high, and by merely throwing floors across at mid-height there would be 620,582 cubic feet, and above 40,500 square feet of floor surface available for barrack rooms, with a height of about 15 feet per room.

Another room, 25 feet 8 inches high, might possibly be divided by a floor into two rooms, each 12 feet 6 inches high, and if this were done 53,309 cubic feet and 4,148 square feet of barrack-room space would be obtained. Another room, if similarly divided, would afford 67,200 cubic feet and 5,712 square feet in rooms about 11½ feet high.

There are altogether 20 wards in the hospital, many of them lofty and of large size, but none are lofty enough to admit of division into two floors except those already mentioned. If all the rooms were improved, properly subdivided, and rendered fit for use; if they had sufficient window and door space opening from external galleries; together with abundant means of ventilation, these hospital buildings might very well accommodate from 800 to 900 men in a situation where additional barrack room is very much required for defence purposes, and where there is no place to build it.

Vittoriosa hospital would accommodate about 100 men on the upper floor. But none of the other wards are fit for anything else but store rooms.

In round numbers, barrack accommodation for 1,000 men might be obtained by building a hospital at Valetta for 300 beds, and another at Vittoriosa for 136 beds, and by incurring the moderate additional cost of adapting the present hospital buildings for barracks.

### 20.—Burial Grounds.

There are two military burial grounds belonging to the garrison. One of these is situated on a steep slope overlooking the quarantine harbour, immediately outside the works of Valetta. The other is close to Verdala barracks, on the Cotonera side. They are each about half an hour's marching distance from the hospitals. The subsoil is rock, and there is no surface soil except what is produced by pulverizing the rock. The Valetta ground has been buried over more than once, and is in a very unsatisfactory state on account of the extension of the defences, by which the surface has been partly covered with rubbish. It appears to be saturated with human remains, as it becomes occasionally offensive in hot weather, and has to be partly covered with earth. A new burial ground is required, and it should be placed outside the lines, as there is no available space within. The civil government contemplate the laying out of a cemetery on a sufficient scale at a short distance from Valetta; and possibly some adjoining ground might be found available for a military cemetery, without offending the religious prejudices of the native population. About an acre and a half to two acres would afford the required area.

In the preceding pages we have stated the general results of our inspection and inquiries, and we now proceed to give as briefly as possible the more important sanitary points bearing on the health of the troops in each barrack and hospital separately.

## SECTION III.—DETAILED REPORTS ON BARRACKS AND HOSPITALS.

### 1.—Fort St. Elmo.

This is a large fort, situated at the northern point of the town of Valetta where the land projects into the open sea, which encircles the fort on three out of its four sides, and ensures an ample external ventilation for the position. The site varies in elevation above the sea-level, following in this respect the natural configuration of the ground. It is divided into two parts, called Upper and Lower St. Elmo, differing considerably in elevation and also in the sanitary condition of the barracks in each division. Upper St. Elmo occupies comparatively high ground, and rises considerably above Lower St. Elmo, the occupied area of which latter is very little raised above the water level.

Upper St. Elmo.—This large work consists of salient bastions and curtains, partly formed out of the solid rock.

The area within the crest of the parapet is about 3,120 square yards. The surface soil of the barrack square is sandy and the subsoil rock. The parapets and bastions rise considerably above the level of the principal barracks, and at the northern angle of the fort a lofty cavalier overtops all the buildings and cuts off to a considerable extent the cool winds from that quarter. This cavalier and the ramparts enclose within them an irregular area of ground approaching to a square form, about 250 feet across, along the sides of which are built the brigade offices, officers' quarters, mess establishment, and part of the soldiers' barracks, while the principal portion of the latter class of accommodation, amounting to 20 rooms, occupies a long building crossing the area from east to west, and forming one side of the barrack square.

Behind and to the north of this building, and separated from it by an intervening space of from 30 to 50 feet in width, are two blocks of building containing the ablution rooms, women's wash-houses, cook-houses, and engineer stores. At the east end of one of these blocks nearest the sea are placed the privies and an ashpit.

The other sides of the square are formed by soldiers' rooms on the ground floor, with the brigade offices and officers' quarters on the floors above, and by the mess establishment.

At a higher level, and immediately to the south of the officers' quarters, are two long ranges of one-story rooms partly used as married quarters, and in the southern bastions are two blocks containing six soldiers' rooms in each. There is another row of barrack rooms along the southern side of the top of the cavalier; they have small courts in front of them, and are appropriated as serjeants' quarters.

The external ventilation of these various groups of rooms differs according to their degree of exposure to winds and also to the extent of their isolation from adjacent walls. One entire range of rooms on the south side of the square, Nos. 63 to 69 inclusive, abuts directly on the rock; they are damp and have no through draught. The present occupants, who are married people, suffer from unusual sickness on account of the twofold defect of dampness and want of fresh air. Rooms 50, 51, and 52 are also damp on account of one side serving as a revetment to the terreplein of the battery.

The other rooms are all more or less isolated; the principal barrack blocks are two floors in height, but most of the rooms appropriated as married and serjeants' quarters are only of one floor.

All the rooms are built of soft Maltese stone, and have arched verandahs along one side above and below. The upper verandahs are reached by outside stairs, and afford the means of entrance to the upper floor of rooms. Several rooms communicate with each other by doors in the division walls. The floors are constructed of hard and of soft stone except in one case where cement has been used. The lower floors are not raised above the ground, but are generally laid on earth or rubbish, in the upper rooms the stone floors are laid on joists or arches. There are no fireplaces in the barrack rooms.

The following table gives the statistics of the barrack accommodation:—

Date of Construction: the time of the Knights.
Total Number of Rooms, 73.
Total Regulation Number of Men, 226.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 8 | 24 5 | 14 8 | 5 4<br>7 2 | 493 | 44¾ | 1<br>1<br>2 | 3 4<br>2 7<br>3 9 | 2 4<br>1 7<br>2 2 |
| 2 | 8 | 24 5 | 14 8 | 5 4<br>7 2 | 493 | 44¾ | 1<br>1<br>2 | 3 4<br>2 7<br>3 9 | 2 4<br>1 7<br>2 2 |
| 3 | 8 | 24 5 | 14 7 | 5 4<br>7 2 | 491 | 44½ | 1<br>1<br>2 | 3 4<br>2 7<br>3 9 | 2 4<br>1 7<br>2 2 |
| 4 | 8 | 24 5 | 14 7 | 5 4<br>7 2 | 491 | 44½ | 1<br>1<br>2 | 3 4<br>2 7<br>3 9 | 2 4<br>1 7<br>2 2 |
| 5 | 8 | 24 5 | 14 8 | 5 4<br>7 2 | 493 | 44¾ | 1<br>1<br>2 | 3 4<br>2 7<br>3 9 | 2 4<br>1 7<br>2 2 |
| 6 | School | 24 5 | 14 8 | 5 4<br>7 2 | - - | - - | 1<br>1<br>2 | 3 4<br>2 7<br>3 9 | 2 4<br>1 7<br>2 2 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 7 | 8 | 24 5 | 14 8 | 5 4 / 7 1 | 480 | 44¾ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 8 | Library | 24 5 | 14 8 | 5 4 / 7 2 | - - | - - | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 9 | 8 | 24 5 | 14 8 | 5 4 / 7 2 | 493 | 44¾ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 10 | Serjeants' Mess | 24 5 | 14 8 | 5 4 / 7 2 | - - | - - | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 11 | 11 | 25 8 | 16 0 | 14 4 | 534 | 37¼ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 12 | 11 | 25 8 | 16 2 | 14 4 | 540 | 37½ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 13 | 11 | 25 8 | 16 1 | 14 6 | 544 | 37½ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 2 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 14 | 11 | 25 8 | 16 0 | 14 4 | 535 | 37¼ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 2 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 15 | 11 | 25 8 | 16 2 | 14 2 | 534 | 37½ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 16 | 11 | 25 8 | 16 0 | 14 4 | 535 | 37¼ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 17 | 11 | 25 8 | 16 0 | 14 4 | 535 | 37¼ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 18 | 11 | 25 8 | 16 0 | 14 4 | 540 | 37½ | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 19 | 11 | 25 8 | 16 3 | 14 6 | 549 | 38 | 1 | 3 4 | 2 4 |
| | | | | | | | 1 | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 20 | 11 | 25 8 | 16 3 | 14 8 | 556 | 38 | – | 2 0 | 1 9 |
| | | | | | | | – | 2 7 | 1 7 |
| | | | | | | | 2 | 3 9 | 2 2 |
| 21 | 1 | 17 4 | 10 9 | 11 3 | 2,096 | 186 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 2 10 | 2 7 |
| 22 | 1 | 17 5 | 10 9 | 11 3 | 2,107 | 187 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 2 10 | 2 7 |
| 23 | 1 | 17 5 | 10 9 | 11 3 | 2,107 | 187 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 2 10 | 2 7 |
| 24 | 1 | 17 6 | 10 9 | 11 4 | 2,132 | 188 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 2 10 | 2 7 |
| 25 | 1 | 17 4 | 10 9 | 11 4 | 2,112 | 186 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 2 10 | 2 7 |
| 26 | 1 | 17 4 | 10 9 | 11 4 | 2,112 | 186 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 3 6 | 2 6 |
| 27 | 6 | 17 6 | 14 6 | 13 1 | 553 | 42 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 3 6 | 2 6 |
| 28 | 6 | 17 6 | 14 3 | 13 1 | 543 | 41½ | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 3 6 | 2 6 |
| 29 | Tailor's Shop | 17 6 | 17 6 | 13 0 | - - | - - | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 3 6 | 2 6 |
| 30 | | 17 6 | 17 6 | 13 0 | - - | - - | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 3 6 | 2 6 |
| 31 | | 17 5 | 14 2 | 13 0 | - - | - - | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 3 6 | 2 6 |
| 32 | 6 | 17 6 | 14 2 | 13 0 | 537 | 41 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 3 2 | 2 6 |
| 33 | 6 | 17 7 | 14 1 | 13 0 | 537 | 41 | 1 | 3 0 | 2 3 |
| | | | | | | | 1 | 3 2 | 2 6 |
| 34 | 6 | 17 7 | 14 2 | 13 0 | 538 | 41⅔ | 1 | 3 0 | 2 3 |
| | | | | | | | 2 | 3 9 | 2 2 |
| | | | | | | | 1 | 3 6 | 2 6 |
| 35 | 5 | 17 5 | 11 11 | 12 5 | 515 | 41½ | 1 | 2 10 | 2 3 |
| | | | | | | | 1 | 3 6 | 2 6 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 36 | 5 | 17 6 | 12 0 | 12 8 | 532 | 42 | 1<br>1 | 2 10<br>3 6 | 2 3<br>2 6 |
| 37 | 5 | 17 5 | 12 0 | 13 0 | 543 | 41¾ | 1<br>1 | 2 10<br>3 6 | 2 3<br>2 6 |
| 38 | 5 | 17 5 | 12 0 | 13 0 | 543 | 41¾ | 1<br>1 | 2 10<br>3 6 | 2 3<br>2 6 |
| 39 | 5 | 17 6 | 12 0 | 13 2 | 553 | 41¾ | 1<br>1 | 2 10<br>3 6 | 2 3<br>2 6 |
| 40 | 5 | 17 6 | 12 4 | 13 2 | 568 | 43 | 1<br>1<br>1 | 2 10<br>2 8<br>3 6 | 2 3<br>4 3<br>2 6 |
| 41 | Officers' Quarters | 20 0 | 14 0 | 14 0 | - - | - - | 1<br>1 | 5 6<br>2 8 | 3 6<br>3 4 |
| 42 | Officers' Quarters | 20 0 | 14 0 | 14 0 | - - | - - | 1<br>1 | 2 9<br>2 8 | 2 2<br>3 4 |
| 43 | 1 | 20 0 | 14 0 | 14 0 | 3,920 | 280 | 1<br>1 | 2 9<br>2 8 | 2 2<br>5 4 |
| 44 | 1 | 20 8 | 14 3 | 14 1 | 4,147 | 294 | 1<br>1 | 2 9<br>2 8 | 2 2<br>3 4 |
| 45 | 1 | 20 8 | 14 1 | 14 1 | 4,099 | 291 | 1<br>1 | 2 9<br>2 8 | 2 2<br>3 4 |
| 46 | 1 | 20 8 | 14 9 | 14 2 | 4,320 | 305 | 1<br>1 | 5 0<br>2 8 | 2 2<br>3 4 |
| 47 | 1 | 20 8 | 14 3 | 14 4 | 4,221 | 294 | 1<br>1 | 2 9<br>2 8 | 2 2<br>3 4 |
| 48 | 1 | 20 7 | 14 2 | 14 3 | 4,158 | 292 | 1<br>1 | 4 9<br>3 2 | 2 2<br>2 6 |
| 49 | School | 12 2 | 8 2 | 13 9 | - - | - - | 1 | 2 6 | 3 2 |
| 50 | Carpenter's Shop | 17 3 | 12 4 | 13 9 | - - | - - | 1<br>1 | 3 4<br>2 6 | 2 8<br>3 2* |
| 51 | Shoemaker's Shop | 21 7 | 12 4 | 13 6 | - - | - - | 1<br>2 | 2 7<br>3 8 | 2 7<br>2 3 |
| 52 | Shoemaker's Shop | 13 4 | 12 4 | 13 6 | - - | - - | 1 | 3 9 | 2 3 |
| 53 | 1 | 18 3 | 12 8 | 9 4 | 2,157 | 231 | 1<br>1<br>1 | 2 6<br>2 9<br>2 6 | 1 10<br>2 9<br>2 6 |
| 54 | 1 | 14 6 | 13 0 | 10 0 | 1,885 | 188 | 1 | 2 6 | 1 7 |
| 55 | 1 | 14 6 | 12 2 | 9 6 | 1,676 | 176 | 1 | 2 7 | 1 8 |
| 56 | Lighthouse-man | 14 6 | 12 0 | 10 2 | - - | - - | 1 | 2 7 | 1 8 |
| 57 | 1 | 14 6 | 12 0 | 9 3 | 1,609 | 174 | 1 | 2 7 | 1 7 |
| 58 | 1 | 14 0 | 10 7 | 8 8 | 1,284 | 148 | 1 | 2 7 | 1 7 |
| 59 | Warrant Officer | 14 4 | 12 4 | 9 5 | 1,664 | 176 | 1 | 2 8 | 2 0 |
| 60 | 1 | 14 4 | 12 8 | 9 5 | 1,720 | 181 | 1 | 2 4 | 1 10 |
| 61 | 1 | 14 4 | 12 5 | 9 5 | 1,676 | 178 | 1 | 2 9 | 1 10 |
| 62 | 1 | 14 4 | 12 5 | 9 5 | 1,676 | 178 | 1 | 2 9 | 1 10 |
| 63 | 1 | 14 6 | 13 10 | 11 9 | 2,356 | 200 | 1 | 2 9 | 2 6 |
| 64 | 1 | 14 6 | 13 10 | 11 9 | 2,356 | 200 | 1 | 2 9 | 2 6 |
| 65 | 1 | 14 6 | 13 10 | 11 9 | 2,356 | 200 | 1 | 2 9 | 2 6 |
| 66 | 1 | 14 6 | 13 10 | 11 9 | 2,356 | 200 | 1 | 2 9 | 2 6 |
| 67 | 1 | 14 6 | 13 10 | 11 9 | 2,356 | 200 | 1 | 2 9 | 2 6 |
| 68 | 1 | 14 6 | 14 3 | 11 9 | 2,367 | 207 | 1 | 2 9 | 2 6 |
| 69 | 1 | 13 10 | 16 4 | 11 7 | 2,560 | 226 | 1<br>1 | 2 9<br>1 0 | 2 6<br>3 0 |
| 70 | Quartermaster's Store. | 21 3 | 17 0 | 10 4 | - - | - - | 1<br>1 | 3 9<br>3 9 | 2 6<br>3 0 |
| 71 | Quartermaster's Store. | 19 3 | 15 5 | 11 3 | - - | - - | 1<br>1 | 3 5<br>3 9 | 2 9<br>3 0 |
| 72 | Quartermaster's Store. | 19 3 | 14 0 | 11 4 | - - | - - | 1 | 3 9 | 2 3 |
| 73 | Serjeants' Mess and Kitchen. | 17 3 | 10 8 | 11 2 | - - | - - | 1 | 3 6 | 2 0† |
| Guard Room | 17 | 21 4 | 9 9 | 8 4 | 102 | 12 | 1 | 3 6 | 2 6‡ |
| Prison Cells | 1 | 20 4 | 12 6 | 9 6 | 2,414 | 254 | — | — | — |
| Prison Cells | 1 | 20 6 | 12 6 | 9 6 | 2,434 | 256 | — | — | — |
| Prison Cells | 1 | 22 3 | 10 8 | 5 0<br>12 2 | 3,737 | 237 | — | — | — |

* Supports to roof.

† Small supports to roofs.

‡ Part of the guard remain in the covered passage.

*Overcrowding.*—Considering the local climate of Malta, these barrack rooms are unquestionably overcrowded. The table shows that the cubic space per man varies from 480 to 550 feet; and that the superficial area, which is of still greater importance, varies from 37½ to 51 square feet per man. The largest of these quantities is about a third less than should be allowed as a general rule, but considering the elevated and healthy position of the barracks, they would accommodate the following numbers:

The rooms Nos. 1 to 10 should have six men instead of eight per room.

Nos. 11 to 20 should have each nine men instead of 11.

Nos. 27 to 34 should have their inmates reduced from six to five per room.

And Nos. 35 to 40 should have each four men instead of five.

The accommodation would hence be as follows:—

| Number of Rooms. | Present Number of Men per Room. | Total present Number of Men. | Proposed Number of Men per Room. | Total Proposed Number of Men. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|---|
| 7 | 8 | 56 | 6 | 42 | 14 |
| 10 | 11 | 110 | 9 | 90 | 20 |
| 5 | 6 | 30 | 5 | 25 | 5 |
| 6 | 5 | 30 | 4 | 24 | 6 |
| 28 | — | 226 | — | 181 | 45 |

Considering the open position of the upper fort, these rooms would accommodate 181 men, leaving a deficiency of 45 men to be otherwise placed. The proposed reduction would afford only about 660 cubic feet per man, which is certainly not an extravagant allowance. It has been stated to us that in the hot weather the men often take their beds out of the rooms and sleep in the open air under the arches running along the front of their barracks, on account of the heat occasioned by the crowding within. All the bedsteads are of iron.

*Ventilation.*—None of the rooms have any special means of ventilation except by the doors and windows. In Nos. 1 to 20 inclusive, which are the principal barrack rooms, there is one window over the door, and two on the side opposite the door. No. 6 room has also a window on each side of the door. In Nos. 21 to 48 inclusive, there is one window over the door and one on the side opposite. No. 34 has another window on the same side as the door, and No. 41 has one on the side adjacent to the door. No. 49 has a window on each side of the door. No. 50 has two windows on the same side as the door. No. 51 has two windows on the side adjacent to the door, and one opposite to them. Nos. 53 to 62 inclusive, have one window each on the side opposite to the door, and Nos. 63 to 73 inclusive have one window on the side opposite to the door.

All the windows, especially those in the men's rooms, are very small in size. The largest are only 3 feet 9 inches by 2 feet 2 inches, and the smallest are 2 feet 7 inches by 1 foot 7 inches. None of them open at the top, and all of them are not supplied with glass, for in almost every room one or more of the windows have only wooden shutters. When these wooden shutters are left open, ventilation is more or less effectual, but in windy, rainy, or cold weather they are generally closed, and there is hence no ventilation. Practically the rooms are seldom ventilated, because there is generally some one who objects to the shutters being open, and they are closed to avoid disputes.

The windows should be enlarged and glazed. Separate ventilating arrangements, with shafts carried from the ceiling of each room above the roof, together with inlets for fresh air of the dimensions laid down in the preceding part of this report, are necessary for health. *See* Plan X. To show the importance of this, and also the necessity of preventing overcrowding and of improving the drainage of these barracks, it is sufficient to state that, notwithstanding their elevated position and their proximity to the sea, the rooms had to be abandoned in 1850 on account of cholera.

*Lighting.*—Gas pipes are laid on to the barrack rooms, but gas has not yet been supplied owing to some difficulty in making arrangements with the gas company. This should be settled at once, and the present unsatisfactory mode of lighting discontinued. There are only small oil lamps; used as long as the ration of oil for the week lasts, and then the men have to buy candles.

*Ablution Rooms.*—There is one ablution room, partly closed in front by a screen wall about eight feet high, leaving free space above for ventilation. There is a stone bench for basins, with six taps supplying *salt water* only. This room used to be occupied for playing bagatelle, because the men objected to use salt water, with which they could

not wash themselves. At present fresh water for washing has to be carried from pumps in the barrack square. It ought to be laid on from a cistern to the present salt water taps. Because by that means a definite daily allowance would be available for purposes of cleanliness.

*Bathing Accommodation.*—None. Three baths supplied with fresh water would be required to afford the necessary means of cleanliness to the men. Space walled off and lighted might be found for them in the ablution room.

*Cook-houses.*—There are two cook-houses, 17 feet 6 inches long by 12 feet 10 inches wide, each supplied with four boilers, but no ovens. The men often get their dinners baked out of the Fort in consequence of the absence of means of varying the cooking, at a great additional expense to the mess. These cookhouses have neither drainage nor water supply. Water has to be carried from the pump, and the refuse water is carried out and thrown down a drain close to the men's privy.

*Wash-houses.*—There are two wash-houses; one fitted with two boilers, and the other with ten charcoal stoves. There are no other conveniences for washing. The linen is dried on the roofs of the buildings, but as the smoke from the boilers soils it, the boilers are never used. One of the barrack urinals is next door to one of these wash-houses.

*Latrines.*—There are latrines both for men and women, with water troughs of Maltese stone. Water is thrown into them every morning, and they can be flushed into a drain, which is supposed to run direct into the sea. The construction and material of these latrines are very imperfect, and give rise to great nuisance. There are no proper seats, only a rail being provided, and there are no divisions. They require entire re-construction, with troughs on Macfarlane's or Jenning's pattern, and a proper water supply.

*Drainage.*—Very little appears to be known as to the drainage of the fort, or as to the dimensions either of sewers or drains. One drain we found discharging itself through the works of Upper St. Elmo down the face of the lofty wall into an open space of ground between the works and the military prison in Lower St. Elmo. The drains are merely troughs cut in the soft porous rock, which absorbs a great part of the fluids they are intended to remove. They should be replaced by close earthenware pipes.

The main drain connected with the latrines is carried the whole breadth of the fort and discharged through the works into the sea. The drainage is said to be sufficient to carry away all surface and refuse water. Most of the fluid refuse is thrown down the men's latrine.

*Cleansing.*—There are two ashpits in close confined positions, into which all the solid refuse of the barracks is thrown until it is removed by the contractor. These ashpits were in a most offensive and unwholesome condition at the time of our inspection. They ought to be abolished, and all the refuse collected in iron boxes and removed every day. The stable dung from four horses is removed daily, and there can be no reason why all the other refuse should not be dealt with in the same manner.

*Officers' Quarters.*—These are in rooms built against the rock, and the result is that fever is not uncommon among their occupants. In this and in all similar cases we are of opinion that a well ventilated and drained area should be formed between the rooms and the rock so as to leave an open space between the rock and the quarters to afford a free circulation of air.

*Quarters for Married Non-Commissioned Officers and Soldiers.*—There are no special quarters for married people; and a number of small soldier's rooms are mis-appropriated to this purpose. Some have only one room, with a door at one end and a window at the other. Some quarters have a small yard in front, containing a fireplace for cooking. The rooms have generally fireplaces and glazed windows.

*Canteen.*—The canteen is very small and not in good condition. It could be made more comfortable, but there is no room to enlarge it.

*Prison Cells.*—There are some cells in Upper St. Elmo attached to the military prison, but not properly arranged for keeping the prisoners separate. Each cell has to be occupied by five men, and the ventilation is not sufficient. There is a window over the door of each cell, and also loopholes.

The guard-room cells are quite unfit for occupation. They have no ventilation except into a dark unventilated passage. There are two lock-up rooms, one with a large ventilating skylight, the other is unfit for occupation.

*Guard-room.*—This room is walled off from the arch of the gateway. It is not good. The guard bed is made of two parts, to turn up, in order to give more space on the floor, and to enable the space under the bed to be cleaned.

*The following are the Sanitary Improvements required for Upper St. Elmo.*—1. Diminution of overcrowding to the extent shown in the preceding table.

2. Permanent ventilation by shafts carried through the roof, as in Plan X., and inlets for fresh air near the ceilings of all the rooms. Glass to be used for windows instead of boards. Gas to be supplied for lighting.

3. A constant supply of fresh water from a cistern to be provided for the ablution room. Baths with water to be placed in a space cut off from the ablution room.

4. Cookhouses to be provided with the new steel boilers and oven for economizing fuel (Plan XVIII.,) and supplied with water, and drained.

5. Fixed tubs with water to be provided for the women's wash-house.

6. Latrines to be reconstructed with Macfarlane's or Jennings' apparatus, Plans XII. and XIII., and supplied with water for flushing. If fresh water is not available, brackish or salt water to be used.

7. Drainage to be improved on the principles laid down in the previous part of this report. Ashpits to be abolished, iron boxes substituted, and refuse removed daily.

8. All quarters built against the rock to be ventilated by shafts carried up from the back, and the rock to be cut away, leaving an area to ensure thorough ventilation behind.

9. Canteen to be improved.

10. Guard room cells to be improved if possible, or to be abandoned. Ventilation of all cells to be increased.

Lower St. Elmo.—This work is situated to the west and immediately under Upper St. Elmo. It consists of a long, confined, deep-sunk area, the surface of which is only four feet above the sea-level, and surrounded on all sides by lofty walls excluding the sea breeze. On the side of the court towards the sea is a range of casemates in three floors sunk below the level of the terreplein of the curtains outside; they were constructed by the Knights as bombproof stores, and to protect women during a seige, but were never intended for permanent human habitation. They have nevertheless been occupied for many years by troops, and from first to last have entailed a large amount of suffering and mortality upon their successive occupants, as well as great pecuniary loss on the country. About 30 years ago the ground floor, constituting a third of the accommodation, was abandoned on account of damp, from the floor being close on the sea-level, and from its excessive unhealthiness, since which event there has been an improvement in the sanitary condition of the troops.

The total area of ground within the boundary of the work is 1 acre 2 roods 22 poles. The surface soil is pulverized rock, and the subsoil is the sandstone on which the works are situated.

The casemates present a long front, bent at the flanks, to the parade ground, and as their windows face towards the south without any protection from the sun's rays, they are exposed to excessive heat in summer. On the side of the court opposite to them is part of the lofty works of Upper St. Elmo, the military prison, constructed on a shelf of rock at a higher level, and the armoury. There is a stable for five horses in the left flank of the barracks, under the officers' quarters, and next door to the serjeants' mess; and close to the stable there are four officers' quarters. In this position, very faulty in structure and also unhealthy, is an extremely offensive privy in a casemate. Part of the space of the parade ground is taken up by two ball courts, and the main drain from Upper St. Elmo runs the whole length of the parade ground, receiving the drainage of privies, wash-houses, &c., in its course, and is ultimately carried through the works into the quarantine harbour.

There are in all 38 rooms in this barrack, with regulation space for 756 non-commissioned officers and men, the details of which are given in the following table:—

Date of Construction: time of the Knights.
Total Number of Rooms, 38.
Total Regulation Number of Men, 748.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| *Lower Tier.* | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| No. 1 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | Condemned | | 1 | 3 9 | 6 6 |
| 2 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 9 | 6 6 |
| 3 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 2 6 | 6 6 |
| 4 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 4 9 | 6 6 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 5 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 4 9 | 6 6 |
| 6 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 4 9 | 6 6 |
| 7 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 6 | 8 0 |
| 8 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 6 | 6 6 |
| 9 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 6 | 6 6 |
| 10 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | Condemned | | 1 | 3 6 | 6 6 |
| 11 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 6 | 6 6 |
| 12 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 6 | 6 6 |
| 13 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 6 | 6 6 |
| 14 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 6 | 6 6 |
| 15 | - - - | 54 6 | 21 7 | 4 8 / 9 10 | | | 1 | 3 6 | 6 6 |
| *Centre Tier.* | | | | | | | | | |
| 1 | 24 | 53 0 | 21 10 | 5 0 / 10 8 | 682 | 48 | 1 | 10 8 | 5 2 |
| 2 | 24 | 55 0 | 21 10 | 5 0 / 10 8 | 657 | 50 | 1 | 10 8 | 5 2 |
| 3 | 24 | 55 0 | 21 10 | 5 0 / 10 8 | 657 | 50 | 1 | 10 8 | 5 2 |
| 4 | 24 | 54 6 | 21 10 | 5 0 / 10 11 | 680 | 49½ | 1 | 10 8 | 5 2 |
| 5 | 24 | 55 0 | 21 10 | 5 0 / 10 8 | 657 | 50 | 1 | 10 8 | 5 2 |
| 6 | 24 | 57 0 | 21 10 | 5 0 / 10 8 | 699 | 51¾ | 1 | 10 8 | 5 2 |
| 7 | 24 | 56 7 | 21 10 | 5 0 / 10 6 | 719 | 51½ | 1 | 10 8 | 5 2 |
| 8 | 24 | 56 4 | 21 10 | 5 0 / 10 8 | 724 | 49½ | 1 | 10 8 | 5 2 |
| 9 | 24 | 56 4 | 21 10 | 5 0 / 10 8 | 724 | 49½ | 1 | 10 8 | 5 2 |
| 10 | 24 | 54 3 | 21 10 | 5 0 / 10 9 | 665 | 49⅓ | 1 | 10 8 | 5 2 |
| 11 | 24 | 55 0 | 21 10 | 5 0 / 10 8 | 657 | 50 | 1 | 10 8 | 5 2 |
| 12 | 24 | 54 0 | 21 0 | 5 0 / 10 8 | 666 | 47¼ | 1 | 10 8 | 5 2 |
| 13 | 24 | 52 6 | 21 10 | 5 0 / 10 8 | 675 | 47¾ | 1 | — | — |
| 13A | 1 | 16 0 | 21 0 | 5 0 / 10 8 | 4,736 | 336 | 1 | — | — |
| 14 | 24 | 51 9 | 21 4 | 5 0 / 10 6 | 652 | 46 | 1 | 10 8 | 5 2 |
| *Upper Tier.* | | | | | | | | | |
| 1 | 24 | 53 8 | 21 10 | 9 6 / 6 8 | 672 | 48⅝ | 1 | 10 8 | 5 2 |
| 2 | 24 | 55 9 | 21 10 | 9 6 / 6 6 | 692 | 56¾ | 1 | 10 8 | 5 2 |
| 3 | 24 | 55 8 | 21 10 | 9 6 / 6 6 | 691 | 56¾ | 1 | 10 8 | 5 2 |
| 4 | 24 | 56 0 | 21 10 | 9 7 / 6 5 | 695 | 50 11/12 | 1 | 10 8 | 5 2 |
| 5 | 24 | 55 8 | 21 10 | 6 7 / 6 5 | 691 | 56¾ | 1 | 10 8 | 5 2 |
| 6 | 24 | 58 0 | 21 10 | 9 7 / 6 5 | 719 | 52¾ | 1 | 10 8 | 5 2 |
| 7 | 24 | 58 0 | 21 10 | 9 7 / 6 5 | 719 | 52¾ | 1 | 10 8 | 5 2 |
| 8 | 24 | 57 8 | 21 10 | 9 6 / 6 8 | 724½ | 50¾ | 1 | 10 8 | 5 2 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | | Breadth. | | Height. | | | | No. | Height. | | Width. | |
| No. | | Ft. | in. | Ft. | in. | Ft. | in. | | | | Ft. | in. | Ft. | in. |
| 9 | 24 | 55 | 7 | 21 | 10 | 9 4<br>6 10 | | 695 | $50\frac{5}{12}$ | 1 | 10 | 8 | 5 | 2 |
| 10 | 24 | 55 | 8 | 21 | 10 | 9 4<br>6 10 | | 696 | $56\frac{3}{4}$ | 1 | 10 | 8 | 5 | 2 |
| 11 | 24 | 55 | 0 | 21 | 0 | 9 4<br>6 11 | | 694 | 50 | 1 | 10 | 8 | 5 | 2 |
| 12 | 24 | 55 | 5 | 21 | 10 | 9 4<br>6 10 | | 699 | $50\frac{1}{3}$ | 1 | 10 | 9 | 5 | 2 |
| 13 | 24 | 53 | 4 | 21 | 10 | 9 4<br>6 9 | | 664 | 48 | 1 | 10 | 8 | 5 | 2 |
| 13A | 1 | 19 | 0 | 21 | 6 | 9 0<br>6 4 | | 5,341 | 408 | 2 | 8 | 3 | 5 | 0 |
| 14 | 24 | 54 | 0 | 21 | 5 | 9 0<br>6 10 | | 655 | 48 | 1 | 10 | 0 | 5 | 2 |
| 16 | 38 | 70 9<br>8 0 | | 24 17 | 0 6 | 8 4<br>6 8<br>6 6<br>6 8 | | 568 | 48 | 1 | 9 | 2 | 6 | 0 |
| 17 | 38 | 79 | 6 | 24 | 6 | 8 4<br>6 8 | | 650 | 51 | 1 | 9 | 2 | 6 | 0 |
| *Staff Serjeants' Quarters.* | | | | | | | | | | | | | | |
| 1 | 1 | 18 | 2 | 9 | 0 | 12 | 0 | 1,962 | 163 | 1 | 3 | 6 | 3 | 0 |
| 2 | 1 | 17 | 6 | 11 | 10 | 12 | 0 | 2,484 | 207 | 1 | 3 | 6 | 3 | 0 |
| 3 | 1 | 17 | 6 | 14 | 3 | 11 | 9 | 2,925 | 249 | 1<br>1<br>1 | 2<br>2<br>3 | 3<br>3<br>6 | 1<br>1<br>3 | 10<br>8<br>0 |
| 4 | 1 | 17 | 2 | 15 | 6 | 7 10<br>3 0 | | 2,441 | 266 | 2<br>1 | 5<br>1 | 3<br>9 | 3<br>3 | 0<br>6 |
| 5 | 1 | 17 | 4 | 16 | 6 | 8 6<br>6 0 | | 3,639 | 286 | 2<br>1 | 5<br>1 | 3<br>9 | 3<br>3 | 0<br>6 |
| 6 | 1 | 17 | 4 | 16 | 6 | 8 6<br>6 0 | | 3,639 | 286 | 2<br>1 | 5<br>1 | 3<br>9 | 3<br>3 | 0<br>6 |
| Guard Room - | 11 | 27 | 0 | 23 | 0 | 16 | 3 | 917 | 56 | 2 | 2 | 2 | 2 | 11* |
| Prison Cells, each | 6 | 8 | 0 | 7 | 0 | 10 | 3 | 574 | 56 | — | — | | — | |

* Embrasures.

The lower tier of rooms, struck off the barrack accommodation, is now appropriated for reading and day rooms, school, cook-houses, serjeants' mess, canteen, &c., and hence the available accommodation shown in the table consists of 30 men's rooms with space for 748 men, at somewhat less than 700 cubic feet and about 50 square feet per man. This amount of space, though apparently large, constitutes overcrowding in such a locality, and the men have besides fully a third less of superficial area than they ought to have, on account of the height of the arches, nearly 16 feet.

To meet the requirements of health as far as practicable in the existing state of the barrack accommodation we would propose the reduction in the following table, which shows a deficiency of accommodation for 132 men.

| Rooms. | Present Number of Men per Room. | Total present Number of Men. | Proposed Number of Men per Room. | Total proposed Number of Men. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|---|
| 28 Rooms {1 to 14 on each Floor} | 24 | 672 | 20 | 560 | 112 |
| No. 16 - - | 38 | 38 | 26 | 26 | 12 |
| „ 17 - - | 38 | 38 | 30 | 30 | 8 |
| Total - - | — | 748 | — | 616 | 132 |

The construction of the rooms is as follows:—Like other casemates, they have one end to the open air, but instead of this end containing a door and one or more windows, it has only one window, 10 feet 8 inches high by 5 feet 2 inches wide, to afford light

and air to an arch 55 to 58 feet deep. At the end opposite the window the arch abuts directly on the soft porous sandstone rock of the terreplein, which forms its end wall. All the floors are of stone. Entrance is obtained to the different floors by a staircase at each end of the line, and all the casemates communicate with each other by a door at the end nearest the window. Hence, the rooms on each floor all communicate with each other, an arrangement which, however convenient it may be for stores, is the very worst that could be adopted for barrack-rooms, for it enables the foul air to be wafted hither and thither throughout the whole range.

The only way to remedy this great evil would be to carry open terraces on pillars or iron columns along each floor, to answer the double purpose of shade from the sun and means of access, to provide each casemate with a door, and as large an amount of window space as practicable, and to build up the communications between the casemates, so as to give each casemate a separate ventilation. Close to the doorway of each room is a very small serjeant's bunk, partitioned off. These have neither direct light nor ventilation, and can be neither healthy nor comfortable. They should have some direct communication with the outer air, or be entirely removed. A serious cause of unhealthiness in these rooms is the ends of the rooms being formed of the solid rock. The only way to remedy this evil would be to isolate the casemates altogether from the rock, by forming a well ventilated area three or four feet wide all the way along behind them.

*Ventilation.*—Some years ago an attempt was made to ventilate these rooms by carrying up a shaft in the roof at the far end. It was too small, and insufficient, and no fresh air was introduced. Lately, additional shafts have been carried up, of large sectional area, and inlets for fresh air have been provided above the windows. These improvements are reported to be much more efficient; and as the barracks have been more healthy since they were introduced, we consider that it would be better to give them a sufficient trial before making any further alterations in the ventilation.

*Lighting.*—The barracks were at the time of our inspection lighted by oil lamps, but gas fixtures had been provided, and as soon as the difficulties in the way of obtaining a supply of gas could be removed, it was intended to use it for lighting.

*Ablution and Bath Accommodation.*—There is one ablution room in a casemate 45 feet long by 30 feet broad, close to the privy. There are stone benches for supporting iron basins along the walls, and 20 water taps, supplied by the tank adjoining. This tank is 26 feet deep, but it ceases to supply water to the taps when the level falls below 15 feet. The ablution room is situated in a narrow, dark, damp corner. Beyond it, and entered from it, is the issuing store for fuel and lime. There are gratings for the floor, which is constantly wet, from water running over it. There are no pegs, nor forms to sit on; there are no baths.

Over this damp, dark room there are two large barrack rooms which have been condemned as unhealthy. They are, indeed, utterly unfit for human habitation. Close to them there is a small range of rooms inhabited by married soldiers. They have light and air only from the narrow space referred to. Their back wall is the rock, in which a large water tank is excavated; they are dark, damp, unwholesome, and not fit for occupation.

*Cook-houses.*—There are two, situated in ground-floor casemates, one for each wing. They contain ten boilers each, of the usual form, and there is a small oven, which appears to be little used. The improved steel boilers and oven should be substituted for the present apparatus.

*Women's Wash-house.*—This is a semicircular shed opposite the centre of the barrack. It has stone troughs and slabs. Linen is dried on the roof of the barracks. There are no boilers, but there are small fireplaces in a shed, over which water can be heated. The accommodation is said to be sufficient.

*Water* for barrack use is derived from a large tank; the quality is said to be good.

*Privies and urinals.*—There is one long privy for men in a casemate at the narrow close end of the parade ground already mentioned. The arrangement is of the usual ladder construction, with a stone trough, out of which the contents are flushed into the sea with water raised by force pumps. There is a urinal at the entrance door. Both are very offensive, and require reconstruction with Macfarlane's or Jennings' apparatus. The casemate should also have more abundant ventilation, by taking down all the wall under the arch, and putting in a louvred frame.

*Drainage.*—We have been able to obtain no definite account of the drainage of the barrack, and apparently the information could not be obtained without actually opening the drains, which after recent experience it would not be safe to do without removing the troops out of the barracks.

As might be inferred from the levels, the fall is insufficient for removing the surface drainage, together with the soil from the privies belonging to the military prison, and both are retained in cesspits and ill-constructed drains, which are nothing but additional cesspits of larger area. The contents, except such as may sink into the porous rock, have to be removed by hand labour once a week; so that in reality this barrack is not drained, and the present arrangements are very offensive and dangerous to health. One of the cesspits is 40 yards, the other about 20 yards from the nearest quarters They should be abolished, and the drainage should be conveyed away in impervious pipes. Ample fall can be obtained for all the latrine drainage by simply raising the latrines.

The outlets of the city sewers to the south of Lower St. Elmo, are above the water level; and great nuisance is experienced in the barrack whenever the wind blows over them to the Fort. These outlets require to be improved, and extended into deep water by means of iron pipes.

*Cleansing.*—The parade grounds are cleansed every day. The barrack refuse is carried to an ashpit close to the privies, from which it is removed, together with the stable dung, once a day. The ashpit is too deep, and like all such places, is apt to become a nuisance. It would be much better to fill it up to the level of the ground, pave and drain it, and provide iron boxes to receive the refuse, out of which it could be emptied for removal.

*Married Quarters.*—There are none specially appropriated; some unhealthy rooms against the rock, occupied as such, we have already noticed. Sometimes married people are accommodated in the ground-floor casemates, as many as five families being lodged in some of them.

*Sanitary Improvements required for Lower St. Elmo.*—1. Terraced verandahs to be carried along the south front to shade it and give access to rooms. Each room to have a door opening from the terrace, and the communications between the rooms to be built up. Each non-commissioned officer's room to have a window, or the room to be removed altogether. An area with ventilation to be formed between the back of the casemates and the rock.

2. Gas to be laid on.
3. Ablution room to be improved, to have ablution basins as in plan XV., supplied with water, and to have pegs and forms.
4. Cookhouse to have improved steel boilers and ovens, Plan XVIII., or a Benham's apparatus to cook for 400 men.
5. Latrines and urinals to be improved on Macfarlane's or Jenning's principle, Plans XII., XIII., and XIV.
6. Drainage to be improved and the cesspits abolished. Outlets to be improved.
7. Ashpit to be abolished and iron boxes, with daily removal, substituted.
8. Better married quarters to be provided.

*The Military Prison, Lower St. Elmo.*—This establishment is within the same enclosure as Lower St. Elmo, and is built on a shelf of rock at a higher elevation. It is of the construction usually adopted at home, and consists of three floors of cells opening out of a corridor, one side of which is formed by the walls of the cells, and the other side by scarped sandstone rock. In this rock is a large water tank, the floor of which is about 6 feet above the level of the floor of the corridor. The corridor is roofed over, and has ventilating lights above, which are kept closed for fear the rain should beat in. The interior is consequently very imperfectly ventilated, and the air is rendered more foul by the method adopted for supplying air to the corridor. To do this, an air duct has been carried from the door of a most offensive privy in the barrack yard, along under the floor of the prison corridor, and large grated openings allow the foul air to pour directly into the corridor. So offensive was the smell from these gratings that they had to be covered up. This should be remedied by closing up the present inlet and by opening another in a suitable position.

There are 33 cells in the main building and a few others detached, which are made over to Lower St. Elmo for guard-room cells. Each prison cell is 11 feet long by 6 feet wide, and from 10 feet to 10 feet 6 inches high, giving from 660 to 690 cubic feet to each prisoner; too little for health, especially in such a locality. The prison was built in 1850, when the garrison was under 3,000 men. In that year the committals were 174 = 5·8 per cent. of the strength. In 1859 the garrison had been doubled, and the committals had risen to 512 = 8·6 per cent. of the strength, while the prison accommodation remained the same. There is no space to enlarge it, and even if there were it would be unadvisable to do so on account of defect of position. The privies are too close to the building, the

court-yard is too small. The kitchen is not sufficient for the increased number of prisoners.

On account of deficiency of accommodation, prisoners undergoing sentences have to be sent to the dark, crowded, and unhealthy associated cells in Upper St. Elmo. Additional prison accommodation is required to meet the wants of the garrison, for which a very good site might be found on one of the bastions of the Cotonera lines.

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## 2.—Marsamuscetto Barrack.

This barrack was formerly a store consisting of three floors. The basement is still used for stores; the first floor contains the men's barrack accommodation, above which are two ranges of rooms with an open passage between them, one of which, to the front, is occupied as officers' quarters, and the range behind is used as serjeants' quarters, library, &c.

The building is situated on the west side of Valetta, at a low level as compared with the neighbouring ground, and close to the sea, although considerably above it. The houses are very near the barrack, and nearly all winds except those from west and north-west are either cut off by the town, or have to reach the barrack after passing through the streets. The sea, close at hand, receives part of the town drainage in water too shallow to admit of sufficient dilution, and as there is no tide, the odour is at certain periods most offensive and unwholesome. Behind and above the level of the barrack, one of the town aqueducts is carried through the rock, and when this has happened to get out of order, the water has found its way into the barrack. The ends of the rooms next the rock are always more or less damp.

The men's barrack consists of two long casemates placed side by side, abutting at the end furthest from the front on the solid rock. There is a single entrance door into one of the rooms, and the other room has to be reached by a door through the intervening wall. From this second room there is a small door leading into a confined court, surrounded by high walls, containing the cook-houses, privies, urinals, and ashpits. Each room has only one window, 73 feet from the further end of the room. The floors are of soft Maltese stone.

The following table gives the details of the accommodation:—

| Rooms. | Number of Men per Room. | Dimensions. | | | | Cubic Feet per Man. | Superficial Area in Feet per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | Cubic Contents per Room. | | | Number. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | Ft. | | | | Ft. in. | Ft. in. |
| 1 | 42 | 73 0 | 26 3 | 11 9 / 9 0 | 33,630 | 800 | 45½ | 1 | 9 9 | 7 2 |
| | | | | | | | | 1 | 6 0 | 3 0 |
| 2 | 42 | 73 0 | 26 3 | 11 9 / 9 0 | 33,630 | 800 | 45½ | 1 | 9 9 | 7 2 |
| | | | | | | | | 1 | 6 4 | 2 0 |
| Guard Room - | 12 | 26 6 | 18 1 | 13 9 | 6,588 | 549 | 39 | 2 | 6 6 | 3 6 |

The cubic space *per se* ought to be sufficient, but the casemates are nearly 21 feet high, and the superficial area per bed ought to be between 60 and 70 square feet in such a situation. Besides this defect, the beds are necessarily arranged along the walls, and the wall space affords about 3½ feet per bed only, which is about 1½ feet less than a healthy barrack room ought to give. The rooms even for temporary occupancy are not suited for more than 30 men each.

These facts will show that the construction is very unsuitable for a barrack, and that the place does not admit of material improvement.

*Ventilation.*—There is a shaft carried up from the top of the arch farthest from the door, intended to act as an outlet, but there are no inlets for fresh air. One of large area ought to be placed over each end window, close to the top of the arch. The ventilation at present is by no means sufficient.

There are no fireplaces.

The rooms are very imperfectly lighted by oil lamps. Gas pipes are laid on, but no gas is supplied.

*Ablution Accommodation.*—There is a small ablution room in the yard, with stone benches and basins. Water is not laid on; and there are no baths. The floor of the ablution room is not in a good state.

*Cook-house.*—The cook-house has three boilers, but no oven, and the men have to send their dinners to be baked outside. Water for the cook-house is obtained from a pump in the yard. There is no ventilation.

*Privies and Urinals.*—These conveniences are in the yard, and of the usual construction. They are drained into the sea, and flushed daily through one of the town sewers. The buildings are not sufficiently ventilated.

The barrack refuse is collected in ashpits and removed daily. It would be better to substitute an iron box; which could be removed and its contents emptied into the cart.

*Officers' Quarters.*—These quarters are tolerably good and healthy, but they are damp at times from the nature of the stone.

*The Guard Room* is good, but by no means sufficiently ventilated, it should have suitable openings near the roof.

At the time we inspected this barrack there were very few men in it, and the doors and windows were open. It was nevertheless very close and the air was unwholesome; of course at night it must be still more so. It cannot be made a healthy barrack, although it may be improved by increasing the ventilation.

*Sanitary Improvements required.*—1. Large inlets for fresh air, louvred to throw the current up towards the roof, to be introduced close to the top of the arch in the front wall of each room.

2. Gas to be laid on

3. Floor of ablution room to be relaid with hard stone, water to be laid on, and one bath provided.

4. Improved steel boilers and oven Plan XVIII. to be provided for the cook-house, water to be laid on, and the place better ventilated.

5. Privies and urinals to be reconstructed on Macfarlane's or Jennings' principle, Plans XII., XIII., XIV., with a constant water supply.

6. Ashpit to be abolished, an iron box substituted, and refuse to be removed daily.

7. Ventilation of guard room to be improved.

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### 3.—St. James' Cavalier and Strada Torre Barracks.

St. James' Cavalier is a lofty solid work situated at the highest point of Valetta, and overlooking the surrounding country. Its position is a healthy one, but the structure of the lower part of the barracks is certainly not conducive to health. The Cavalier contains three floors of casemated rooms. The upper floor is reached by a long ramp, entering on the eastern side of the cavalier, and constructed in the solid masonry. The access to the two lower floors is from a narrow street on the western side.

The upper floor is known by the name of the Cavalier barracks, the other floors are called Strada Torre barracks.

Cavalier Barracks.—This accommodation consists of a series of six casemated rooms on the northern face of the cavalier, the two corner rooms are longer than the others, and extend about half their length along the east and west sides of the cavalier. All of them communicate with each other by large arches, and they are reached by one doorway about half-way along the ramp. These rooms have one rather small window each, facing to the north.

The two end rooms have one window each, facing one to the east the other to the west. The ramp, which is a large archway, opens to the outer air on the east side, and passes along the entire length of the back of the rooms, and thus, although the structure is not all that could be desired, it is still such as to secure free admission of all healthy winds to the rooms, if the windows and doors are properly used.

There are two other rooms imbedded in the masonry, without any direct light or ventilation. One of these is used as a lavatory, and has a pump for supplying water.

The following table gives the accommodation:—

Date of Construction, the time of the Knights.
Total Number of Rooms, 8.
Total Regulation Number of Men, 136.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 32 | 56 4 | 24 0 | 11 9 / 8 0 | 585 | 42 | 1 | 6 6 | 3 10 |
| 2 | 18 | 38 0 | 24 0 | 11 9 / 8 0 | 882 | 50 | 1 | 6 6 | 3 10 |
| 3 | 18 | 38 0 | 24 0 | 11 9 / 8 0 | 882 | 50 | 1 | 6 6 | 3 10 |
| 4 | 18 | 38 0 | 24 0 | 11 9 / 8 0 | 882 | 50 | 1 | 6 6 | 3 10 |
| 5 | 18 | 38 0 | 24 0 | 11 9 / 8 0 | 882 | 50 | 1 | 6 6 | 3 10 |
| 6 | 32 | 56 4 | 24 0 | 11 0 / 8 0 | 585 | 42 | 1 | 6 6 | 3 10 |
| Serjeant's Bunk | 1 | 14 0 | 6 0 | 1 6 / 9 6 | 882 | 84 | 1 | 3 6 | 2 10 |
| Serjeant's Bunk | 1 | 14 0 | 6 0 | 1 6 / 9 6 | 882 | 84 | 1 | 3 6 | 2 10 |
| Guard Room - | 10 | 12 2 | 12 2 | 12 0 | 177 | 14¾ | 2 | 2 9 | 2 6 |

The great height of the rooms, 19 feet 9 inches, makes them more overcrowded than the cubic space indicates. This is especially the case with Nos. 1 and 6, in which the men have only 42 square feet each. These rooms ought not to accommodate more than 23 men per room, which would reduce the total accommodation from 136 to 118 men.

*Ventilation.*—In all the rooms the window space is deficient and there are no independent means of ventilation except by the chance opening of the windows situated at from 38 to 56 feet from the most distant beds.

As there is no ground belonging to these casemates, the accessories are very few in number. There is an ablution room, but no baths. In an angle of the ramp there are a few boilers for cooking. The latrines are at some distance off, in a communication leading to the main ditch of Valetta.

This barrack requires the following sanitary improvements:—

1. All the windows to be enlarged.
2. Ventilating openings properly louvred to be made close to the top of the arches along the front of all the rooms, and along the sides of the two end rooms.
3. The numbers of men in rooms 1 and 6 to be reduced from 32 to 23 men per room.

These are all the improvements the place admits of.

Strada Torre Barracks.—These barracks, as already stated, are in two floors under the Cavalier barracks in the rear face of the works. They form one side of a small triangular yard. Another side is bounded by a block of four arched rooms used as barrack rooms, although originally intended for stores. The third side of the yard is formed by lofty walls of adjoining buildings, against which in the yard itself are a number of one-story erections used as cook-house, ablution room, &c.

The ventilation for the whole barrack is derived from this court, and the air cannot be otherwise than stagnant and impure. There are 10 rooms in the cavalier part of the barrack, five above and five below. An arched terrace runs along the upper floor, from which all the upper rooms are entered. Each room is 50 feet long, 24 feet wide, and 9 feet high to the spring of the arch, and has only one opening, namely the door at the end. These rooms stand on the construction for 29 men each, 290 men in all.

All these rooms are more or less dark. Some of the lower rooms have openings through the roof into the upper rooms. These lower rooms are only cellars. The upper rooms are partly used as married quarters.

They are unfit for occupation by troops, for they do not admit of being sufficiently lighted and ventilated.

The other block detached from the cavalier contains 4 barrack rooms 80 feet long, 18 feet wide, and 9 feet high to the spring of the arch, which were occupied by 39 men each; giving the total accommodation in this bad barrack at 476 men.

These four rooms have windows on one side, and each window is common to the two floors, so that all the foul air from the rooms below passes into the rooms above. The upper rooms have a lantern in the roof for light and ventilation. The floor of the lower rooms is below the level of the ground. Like the others, they are unfit for troops. All of them appear to have been originally intended for stores, and they are fit for nothing else.

*The Ablution Room* is in the yard. It has troughs, and there is a large foul open drain beneath, in the floor. The married people cook on the top of it, in the open air.

*The Latrine* is of the usual construction and requires ventilation.

There is *a Cook-house* with boilers and no oven, and without sufficient ventilation.

*The Canteen* is in a dark casemate, where is also the serjeants' mess.

*The Guard Room* is part of a casemate, the other part of which is a store. The lock-up is used as an orderly room.

The only recommendation we have to make as regards Strada Torre barracks is that they be abandoned as speedily as possible.

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### 4.—Floriana Barrack.

This barrack is situated on the west side of Floriana, in one of the healthiest districts in Malta, at some elevation above the quarantine harbour, and has ample facilities for drainage. The site ought to have a free external ventilation; but this great and essential condition of health is entirely neutralized by the plan and construction of the buildings, which are so defective that the barrack has been long notoriously unhealthy.

In condemning the construction as quite unsuitable for a barrack, it is only fair to state that the builders never contemplated its being used for such a purpose; they built it for a sail-cloth manufactory. Its application to barrack purposes has been a subsequent idea.

The buildings occupy a long narrow strip of ground about 8,000 square yards in area. The western side of the ground is bounded by a parapet crowning a high wall overlooking the harbour. The eastern side is bounded by a lofty line of building, the ground plan of which consists of small casemated rooms belonging to the barrack, used at present as married quarters, reading rooms, stores, &c., and the upper floors belong to the civil hospital.

The barrack accommodation consists of 12 casemates built side by side. Their outer or western ends are formed by the dead wall of the works which has hitherto had no openings in it, and the eastern ends form one side of a narrow alley, about 25 feet wide, separating the barracks from the lofty walls of the civil hospital and almshouse. The entrance doors and the windows open from this alley, from which the only light and ventilation are obtained, and as a result the air about these casemates, as well as that within them is stagnant, close, and very impure. At the time of our inspection these casemates were occupied by part of the 1st battalion 22nd regiment. The average strength for six months, April to September 1861 inclusive, had been 494 men, of whom 147 had been admitted to hospital, on account of continued fever, with occasional cases of typhoid fever. During the same six months 222 men were in huts, and were once changed by a corresponding number of men from the barracks. These men yielded 57 cases of fevers, so that nearly a third part of the entire force were attacked in six months by this single disease.

The casemates vary in length from 75 feet to 100 feet. They are from 21½ feet to 24 feet 4 inches wide, and 19 feet 3 inches high. The largest casemate holds 54 men, and the others 46 men each. They are connected by doorways through the division walls, and have a circulation of foul air throughout. They constitute in reality one large apartment crossed by division walls with openings in them, and containing, when fully occupied, 560 men. Each casemate has one door to the open air, and one window, so that 12 windows looking towards a dead wall is about the extent of daylight provided for a battalion.

The cubic contents per man vary from 507½ feet to 718½ feet, but as nearly half of the whole space is too high up to be of use, there is considerable surface overcrowding, each man having only from 40 to 43½ square feet.

The following table gives the details of the accommodation:—

Date of Construction: the time of the Knights.
Total Number of Rooms, 45.
Total Regulation Number of Men, 560.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | | Breadth. | | Height. | | | | No. | Height. | Width. |
| No. | | Ft. | in. | Ft. | in. | Ft. | in. | | | | Ft. in. | Ft. in. |
| 1 | 46 | 80 | 4 | 24 | 4 | 12 3 / 7 0 | | 702½ | 42½ | 1 | 6 11 | 6 8 |
| 2 | 46 | 80 | 4 | 24 | 4 | 12 3 / 7 0 | | 702½ | 42½ | 1 | 6 11 | 6 8 |
| 3 | 46 | 80 | 4 | 24 | 4 | 12 3 / 7 0 | | 702½ | 42½ | 1 | 6 11 | 6 8 |
| 4 | 46 | 80 | 4 | 24 | 4 | 12 3 / 7 0 | | 702½ | 42½ | 1 | 6 11 | 6 8 |
| 5 | 46 | 80 | 4 | 24 | 4 | 12 3 / 7 0 | | 702½ | 42½ | 1 | 6 11 | 6 8 |
| 6 | 46 | 80 | 4 | 24 | 4 | 12 3 / 7 0 | | 702½ | 42½ | 1 | 6 11 | 6 8 |
| 7 | 46 | 83 | 0 | 24 | 2 | 12 3 / 7 0 | | 718½ | 43½ | 1 | 6 11 | 6 8 |
| 8 | 46 | 83 | 0 | 24 | 2 | 12 3 / 7 0 | | 718½ | 43½ | 1 | 6 11 | 6 8 |
| 9 | 46 | 83 | 0 | 24 | 2 | 12 3 / 7 0 | | 718½ | 43½ | 1 | 6 11 | 6 8 |
| 10 | 46 | 83 | 0 | 24 | 2 | 12 3 / 7 0 | | 718½ | 43½ | 1 | 6 11 | 6 8 |
| 11 | 46 | 75 | 3 | 24 | 2 | 12 3 / 7 0 | | 651⅓ | 39½ | 1 | 6 11 | 6 8 |
| 12 | 54 | 100 | 0 | 21 | 6 | 9 5 / 6 4 | | 507½ | 39¾ | 1 | 7 6 | 4 6 |
| 12 *a* | Quartermaster's Store | 73 | 9 | 13 | 5 | 5 0 / 9 0 | | - - | - - | 1 | 4 6 | 4 0 |
| 13 | Cook-house - | 20 | 6 | 14 | 4 | 10 4 / 8 6 | | - - | - - | 1 | 4 6 | 4 6 |
| 14 | Coal-hole - - | 13 | 9 | 9 | 0 | 6 3 / 10 9 | | - - | - - | 1 | 3 6 | 0 10 |
| 15 | Cell - - | 13 | 9 | 9 | 0 | 6 3 / 10 9 | | - - | - - | 1 | 3 6 | 0 10 |
| * 16 | Do. - - | 13 | 9 | 9 | 0 | 6 3 / 10 9 | | - - | - - | 1 | 3 6 | 0 10 |
| 17 | Do. - - | 13 | 9 | 9 | 0 | 6 3 / 10 9 | | - - | - - | 1 | 3 6 | 0 10 |
| 18 | 1 | 13 | 7 | 9 | 0 | 6 3 / 10 9 | | 1,979 | 122 | 1 / 1 | 3 6 / 2 6 | 2 10 / 2 0 |
| 19 | 1 | 13 | 7 | 9 | 0 | 6 3 / 10 9 | | 1,979 | 122 | 1 / 1 | 3 6 / 2 6 | 2 10 / 2 0 |
| 20 | 1 | 13 | 7 | 9 | 0 | 5 8 / 9 6 | | 1,736 | 122 | 1 / 1 | 3 6 / 2 6 | 2 10 / 2 0 |
| 21 | 1 | 13 | 7 | 9 | 0 | 7 6 / 6 0 | | 1,607 | 122 | 1 / 1 | 3 6 / 2 6 | 2 10 / 2 0 |
| 22 | 1 | 13 | 9 | 9 | 4 | 5 6 / 6 6 | | 1,411 | 128 | 1 / 1 | 3 6 / 2 6 | 2 10 / 2 0 |
| 23 | 1 | 13 | 7 | 9 | 3 | 5 2 / 5 8 | | 1,225 | 125 | 1 / 1 | 2 6 / 2 6 | 2 6 / 2 0 |
| 24 | 1 | 13 | 7 | 9 | 3 | 3 10 / 6 2 | | 1,128 | 125 | 1 / 1 | 2 6 / 2 6 | 2 6 / 2 0 |
| 25 | 1 | 13 | 8 | 9 | 3 | 3 4 / 6 0 | | 1,331 | 126 | 1 / 1 | 2 6 / 2 6 | 1 6 / 2 0 |
| 26 | Cook-house - | 20 | 6 | 13 | 6 | 14 9 | | - - | - - | 1 | 9 0 | 2 6 |
| 27 | Issuing Store - | 25 | 10 | 15 | 0 | 7 0 / 10 0 | | - - | - - | 1 | 4 0 | 3 6 |
| 28 | Tailor's Shop - | 25 | 10 | 21 | 9 | 7 0 / 9 9 | | - - | - - | 1 / 2 | 5 0 / 5 0 | 3 0 / 3 6 |
| 29 | Serjeants' Mess - | 26 | 0 | 21 | 9 | 7 0 / 10 0 | | - - | - - | 1 / 2 | 5 0 / 2 10 | 3 0 / 2 2 |
| 30 | Orderly Room - | 26 | 0 | 21 | 9 | 7 0 / 10 0 | | - - | - - | 1 / 2 | 5 0 / 4 6 | 3 0 / 3 0 |
| 31 | 2 | 26 | 0 | 21 | 9 | 7 0 / 10 0 | | 4,231½ | 282 | 1 / 2 | 5 0 / 2 6 | 3 0 / 2 0 |
| 32 | 2 | 26 | 0 | 21 | 9 | 7 0 / 10 0 | | 4,231½ | 282 | 1 / 2 | 5 0 / 2 6 | 3 0 / 2 0 |
| 33 | Canteen - - | 26 | 0 | 21 | 9 | 7 0 / 10 0 | | - - | - - | 1 / 2 | 5 0 / 2 6 | 3 0 / 2 0 |

| Barrack Rooms | Regulation Number of Men in each Room | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 34 | 4 | 26 0 | 21 9 | 7 0<br>10 0 | 2,115¾ | 141 | 1<br>2 | 5 0<br>4 6 | 3 0<br>3 0 |
| 35 | 2 | 26 0 | 21 9 | 7 0<br>10 0 | 4,231½ | 282 | 1<br>2 | 5 0<br>2 4 | 3 0<br>1 8 |
| 36 | 2 | 26 0 | 21 9 | 7 0<br>10 0 | 4,231½ | 282 | 1<br>2 | 5 0<br>2 6 | 3 0<br>1 10 |
| 37 | Guard Room - | 19 0 | 19 0 | 6 10<br>10 0 | - - | - - | 1<br>1 | 5 0<br>2 4 | 3 0<br>1 10 |
| 38 | Stables - - | 14 6 | 8 0 | 8 9 | - - | - - | 1 | 5 0 | 3 0 |
| 39 | Armourer's Shop - | 12 0<br>14 7 | 9 0<br>9 3 | 12 2<br>10 4 | - - | - - | 1<br>1 | 3 6<br>3 8 | 2 8<br>2 8 |
| 40 | 1 | 15 6<br>10 6<br>15 5 | 10 6<br>8 9<br>10 5 | 8 6<br>8 7<br>7 2 | 3,322 | 414 | 1<br>1<br>1 | 2 6<br>2 8<br>3 4 | 1 0<br>2 3<br>2 8 |
| 41 | 1 | 19 0 | 15 6 | 15 0 | 4,417 | 294 | 1<br>1 | 3 3<br>3 6 | 2 8<br>3 2 |
| 42 | Serjeants'Cook-house | 13 10 | 9 4 | 6 2<br>7 6 | - - | - - | 1 | 4 6 | 3 6 |
| 43<br>44 | Store - - | 13 8<br>12 0 | 7 5<br>6 0 | 3 4<br>4 0<br>9 0 | - - | - - | 1<br>1 | 2 4<br>1 10 | 1 8<br>1 6 |
| Guard Room in No. 37 Barrack Room | 14 | 19 | 19 | 6 10<br>10 0 | 375 | 25¾ | 1<br>1 | 5 0<br>2 4 | 3 0<br>1 10 |
| Prison Cells - | 4 | 18 6 | 6 0 | 13 9 | 1,526 (each) | 111 | | | |
| | *3 | 13 9 | 9 0 | 6 3<br>10 9 | 2,016 | 124 | 1 | 3 6 | 0 10 |

* Nos. 15, 16, and 17 Rooms.

*Overcrowding.*—Considering the question of overcrowding with reference to the number of square feet per man allowed in these rooms (which is the only element to guide us) we are of opinion that about one third of the inmates should be removed to give the remainder a fair chance of escape from fever. The accommodation would be as follows:—

| Rooms. | Present Number of Men per Room. | Total Number of Men. | Proposed Number of Men per Room. | Total proposed Number of Men. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|---|
| No. | | | | | |
| 11 | 46 | 506 | 30 | 330 | 176 |
| 1 | 54 | 54 | 32 | 32 | 22 |
| Total - | — | 560 | — | 362 | 198 |

*Ventilation.*—Three shafts have recently been carried through the crown of the arch in each casemate to improve the ventilation, but they are by no means sufficient, as we had reason to know when we were in the rooms. The men themselves said that they felt as if their breath never got away from them.

A considerable improvement was at the same time being carried out on trial, in one of the casemates by opening an embrasure through the dead wall at the end. We are of opinion that a similar opening should be made in each casemate, and also that a large window should be made close to the crown of the arch over the embrasures. Each casemate should be flooded with light and air, an improvement which, together with a reduction in the number of inmates, affords the only chance of reducing their present unhealthiness if this barrack is to be occupied in future.

The casemates under the civil hospital are so placed with reference to the buildings and the higher ground behind, that it is impossible to ventilate them properly. Two or three of them have shafts in the arch, but the rooms are in reality unfit for occupation.

*Lighting.*—There is a gas lamp over the outer gate, but there are none in the barrack rooms, which are lighted with a ration of 3 ounces of oil per 12 men per day in winter, and 2 ounces in summer. The lighting is very insufficient, and gas ought to be introduced.

*Ablution and Bath Accommodation.*—There is an ablution shed in the yard but no bath. The accommodation is much too small for the barrack. Water is obtained from a pump and tank.

*Cook-houses.*—There are three of these; two supplied with the usual iron boilers, and one has a small oven. The improved steel boilers and oven should be substituted for them. Water is not laid on, and the cooks have to carry in all the water required, and to carry out the foul water for there is no drainage.

*Wash-houses.*—There are no conveniences for washing or drying linen.

*Latrines.*—There are two sets of latrines, one for men and one for women. They are of the usual form and are flushed with water.

*Drainage.*—The dimensions of the sewers are imperfectly known. One open surface drain runs the whole length of the barrack. The outlet is into the sea about 300 yards away. The drainage is said to be sufficient, but the surface guttering was not good, and required repair. Foul water was lying in the drains along the front of the men's rooms opposite the doors. Great complaint is made of nuisance from a drain belonging to the civil hospital above. This ought to be thoroughly examined and the cause of complaint removed.

*New School-room.*—Outside the barrack gate is a newly constructed reading room, library, and school-room, with windows on opposite sides, but without ventilation. Louvres in the ridge are required and inlets at the eaves.

*Guard Room and Cells.*—There are two sets of prison cells, one at the end of the barrack enclosure, the other recently constructed. The former require more ventilation. The guard room is under the civil hospital, and has no through ventilation. There is no lock-up.

*Huts.*—Part of the battalion is accommodated in a series of wooden huts in the adjacent ravelin, and in the hornwork and crown work of St. Francis bastion. They are all without adequate ventilation, and require it along the ridge, and being moreover in a very dilapidated state they are only of a temporary character, and can hardly be classed as barrack accommodation.

As there is no provision in Floriana barracks for married non-commissioned officers and soldiers, their families are placed in some of the dilapidated huts in the hornwork, and the accommodation is of a very inferior character.

*Sanitary Improvements required.*—If this bad barrack is to be occupied it should have the following improvements carried out:—

1. Removing as many men out of each room as will give 75 to 80 square feet each to the remainder.
2. Ventilating and lighting all the casemates by embrasures at the ends furthest from the entrances, with large windows, made to open, over the embrasures.
3. Gas with ventilated burners to be introduced.
4. Ablution and bath accommodation to be improved, as in Plans XV., XVI., and XVII., and water to be laid on.
5. Latrines to be re-constructed with Macfarlane's or Jennings' apparatus, Plans XII. and XIII. and constantly supplied with water.
6. Drainage of the whole barrack to be improved.
7. New school-room to be ventilated.
8. Cook-house to be supplied with improved steel boilers and oven, Plan XVIII.

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### 5.—St. Francis' Barrack, Floriana.

This barrack is situated in a high and airy position near the southern extremity of Floriana. It consists of a single block of rooms fronting the public street, used as a grain store not many years ago. Behind it is an enclosed parade ground on the sides of which are situated the wash-house, cook-house, library, armoury, stores, and latrines. The area is about 900 square yards in extent, and the subsoil is soft sandstone. On the slope

below the level of the barrack there is a yard containing officers' quarters, condemned on account of being low, ruinous, and damp. These buildings are, nevertheless, occupied as married quarters and infant school.

The barrack block is constructed in two distinct parts, and the entrance to the square passes through the middle of the front. The part of the block towards the square contains two large arched rooms, one on either side the entrance. They are each 26 feet in height, and have nothing over them. The other part of the block facing to the street is in two floors. On the ground floor are four barrack rooms, two on each side the entrance, and each of these rooms communicates with the corresponding large room behind, by means of openings through the wall.

At the end of each large room and opening out of it there are serjeants' rooms, built against the main block. One of these is said to be damp from being somewhat below the level of the road.

The rooms above are reached by a spacious staircase carried up in front, on the half landing of which, behind them, is a single men's room, at present used as a serjeants' mess. The upper rooms are in reality one apartment divided by partition walls carried only partially up, and the roof is supported on arches running along the centre. There are four rows of beds between the opposite windows in certain rooms.

The following are the details of these rooms:—

Date of Construction of Barrack, about 1807.
Total Number of Rooms, 15.
Total Regulation Number of Men, 329.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 32 | 40 3 | 23 6 | 17 0 | 502 | 29½ | 1 | 4 3 | 2 9 |
| | | | | | | | 1 | 6 6 | 4 4 |
| 2 | 23 | 40 3 | 23 6 | 17 0 | 699 | 41 | 1 | 4 3 | 2 9 |
| | | | | | | | 1 | 6 6 | 4 4 |
| | 23 | 40 3 | 25 3 | 16 6 | 729 | 47¾ | 1 | 4 3 | 2 9 |
| | | | | | | | 1 | 4 2 | 1 10 |
| 4 | 20 | 40 3 | 24 0 | 16 6 | 797 | 48 3/10 | 1 | 6 6 | 4 4 |
| | | | | | | | 1 | 4 3 | 2 9 |
| 5 | 44 | 64 6 | 29 0 | 26 0 | 1,105 | 42½ | 1 | 8 8 | 6 10 |
| | | | | | | | 2 | 6 11 | 3 9 |
| 6 | 44 | 64 6 | 29 0 | 26 0 | 1,105 | 42½ | 1 | 8 8 | 6 10 |
| | | | | | | | 2 | 6 11 | 3 9 |
| 7 | 9 | 27 0 | 13 8 | 14 0 | 574 | 41 | 1 | 6 6 | 4 0 |
| | | | | | | | 1 | 3 7 | 1 6 |
| 8 | 46 | 58 2 | 38 4 | 17 0 | 824 | 48½ | 4 | 4 11 | 3 8 |
| | | | | | | | 3 | 5 1 | 4 4 |
| | | | | | | | 1 | 9 7 | 6 2 |
| 9 | 13 | 30 8 | 18 4 | 17 0 | 736 | 43¼ | 1 | 7 9 | 5 3 |
| 10 | 36 | 40 4 | 31 0 | 17 0 | 590 | 34¾ | 1 | 5 0 | 4 3 |
| | | | | | | | 1 | 4 0 | 3 0 |
| 11 | 39 | 40 4 | 26 0 | 17 0 | 457 | 27 | 1 | 5 0 | 4 6 |
| | | | | | | | 1 | 4 0 | 3 0 |
| | | | | | | | 1 | 9 5 | 6 0 |
| Serjeant's Bunk | 1 | 10 0 | 10 0 | 16 3 | 1,625 | 100 | 2 | 3 0 | 2 8 |
| „ „ | 1 | 12 3 | 9 0 | 9 0 | 992 | 110 | 2 | 1 6 | 1 3 |
| | | | | | | | 1 | 3 0 | 1 9 |
| „ „ | 1 | 12 3 | 9 0 | 9 0 | 992 | 110 | 2 | 1 6 | 1 3 |
| | | | | | | | 1 | 3 0 | 1 9 |
| „ „ | 1 | 10 0 | 10 0 | 16 3 | 1,625 | 100 | 2 | 3 0 | 2 8 |
| Guard Room - | 11 | 30 3 | 16 3 | 15 0 | 670 | 44½ | 2 | 5 1 | 3 8 |
| | | | | | | | 1 | 4 6 | 1 0 |
| Prison Cells, 6 - | 1 each | 11 0 | 6 0 | 15 0 | 490 | 66 | 1 | 2 6 | 1 3 |

*Overcrowding.*—It will be seen that on account of the height of the rooms there is considerable surface overcrowding, notwithstanding the comparatively large amount of cubic space allowed per man.

In rooms 1, 10, and 11 the overcrowding is greatest, and about half of the men should be removed out of them. Less surface area is required in this barrack than in the preceding one, because the construction is much better for health. But about 60 to 65 square feet is the smallest amount which should be allowed for each man.

By giving the increase of superficial area required, the number of men per room will be reduced in the following proportions, and the total accommodation will be for 213 instead of for 329 men, showing a deficiency of space for 116 men.

| Rooms. | Present Number of Men per Room. | Proposed Number of Men per Room. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| No. | | | |
| 1 | 32 | 16 | 16 |
| 2 | 23 | 16 | 7 |
| 3 | 23 | 18 | 5 |
| 4 | 20 | 14 | 6 |
| 5 | 44 | 30 | 14 |
| 6 | 44 | 30 | 14 |
| 7 | 9 | 6 | 3 |
| 8 | 46 | 35 | 11 |
| 9 | 13 | 9 | 4 |
| 10 | 36 | 21 | 15 |
| 11 | 39 | 18 | 21 |
| Total - - | 329 | 213 | 116 |

*Ventilation.*—Most of the rooms are very deficient in window space, and some of them have rather a sombre aspect. In rooms 2, 3, 4, and 7 the windows are on one side; in Nos. 5, 6, and 1 they are on two adjacent sides; in Nos. 11 and 8 there are windows on three sides; and in rooms 9 and 10 there are opposite windows. The two lofty arched rooms have ventilators in the roof. The other rooms have none.

One of the chief improvements required for this barrack is to increase largely the window space in the lower floor rooms, by increasing the number of windows and cutting down existing windows to bring their sills nearer the floor. Large inlets for fresh air are required, and also outlet shafts carried up from the lower front rooms to the roof. The upper rooms require free roof ventilation, by ventilating turrets of Muir's pattern.

*Ablution and Bath Accommodation.*—There are no baths, but there is an ablution room in one of the outbuildings behind. It has benches for basins, and a gully grate in the middle of the floor, down which the dirty water escapes. Water is not laid on, but has to be carried from a pump. This room was being completed while we were there.

*Cook-house.*—There is one cook-house fitted with six boilers and an oven, sufficient to cook for a company. Water for cooking has to be carried from the pump. There is no drainage. The women's cook-house was used as a serjeant's mess kitchen.

*Wash-house.*—A small wash-house, with stove, washing troughs, and a boiler, has been provided in the same range as the ablution room and cook-house. It is deficient in water and drainage like the others. At the time we saw it, it was used as an orderly room.

*Latrines and Urinals.*—These are situated on one side of the parade ground, and are both together. The latrines are under cover, and the urinals are outside. They are of the usual construction, and drained into the town sewer. The latrines require roof ventilation, and reconstruction of the troughs to hold water.

*Drainage.*—Like the Maltese drains generally, the drain of this barrack is most disproportionately large. It is no less than 5 feet high and 2 feet wide, and is intended to receive only the rainfall of a small yard and the drainage of the barrack offices.

There is a very large ashpit, said to be cleared out every day. It would be much better to dispense with it and to provide an iron box for receiving the refuse.

There is no library, except a portion of the armoury used for the purpose.

*The Guard room and Cells* are at one end of the barrack. The cells open out of the guard room, and they have no other ventilation except through the guard room by means of a window over the passage door. This window should be closed, and the cells and passage ventilated independently. The cells are used as garrison cells because the military prison is too small.

The guard room has no privy or ablution room, and there is no cooking place for the prisoners.

In the yard, on the slope already mentioned, containing buildings intended for officers' quarters, and on the ground floor of this range, somewhat below the surface level, there is the infant school already mentioned, and a quarter for the mistress. Apparently a drain passes under part of the flooring, and foul air escapes from it to such an extent as to occasion great nuisance, and to make the rooms quite unfit for occupation. This defect ought to be carefully inquired into and remedied.

*Sanitary Improvements required.*—1. Reducing the number of men to the extent specified.

2. Increased window space, and improved ventilation by shafts through the roof, and by inlets near the ceiling, and in the upper rooms by inlets near the ceiling and Muir's ventilators, fig. 19, in the ridge.

3. Latrines to be reconstructed on Macfarlane's or Jennings' plan, Plans XII. and XIII., and supplied with water.

4. Drainage of the barrack to be improved by using pipe drains. Ashpit to be abolished, and an iron box with daily removal of refuse provided.

5. Cook-house to have steel boilers and oven, as in Plan XVIII.

6. Cells to be ventilated.

7. School and schoolmistress' quarters to be removed from the present building until the whole is reconstructed.

### Pavilion Officers' Quarters.

This is a large building, formerly used as the market of Floriana. It is two floors in height, and has an enclosed square in the middle. It has accommodation for two field officers and 20 officers. Under one end of it, and considerably below the ground level, is a subterranean stable for six horses.

It is very offensive, and the foul air from it passes by the windows into the officers' quarters above. The stable should either be removed or three large ventilating shafts should be carried from it above the roof.

At the opposite end of the building there is a quarter over an imperfectly ventilated watercloset, which is said to cause fever among the occupants of the room. This defect requires remedy.

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## 6.—St. Peter's Lower Counterguard (Lascaris).

This work was constructed in 1857–1858, and was occupied in 1859. It is situated at the south-eastern angle of Valetta, and rises about 150 feet above the harbour. It is, as it were, built against the high rock which rises to some elevation behind it. This circumstance, together with the fact that part of the work is cut out of the rock, renders the whole of it more or less damp from percolation of moisture through the soft porous sandstone from the higher elevations above it.

The work is an irregular polygon in form, containing an area of 4,105 square yards within the crest of the parapet, and exposing a large external surface in proportion to its area. The barrack accommodation is constructed on two levels. On the upper level are the officers' quarters and 10 casemated barrack rooms. On the lower level are eight barrack rooms, under those of the upper level, and also the ablution room, cook-house, women's wash-house, privies, canteen, &c. The upper rooms are entered directly from the open court of the upper level, but the lower level rooms open out of a sunk area below the upper level. Six of them are reached by a narrow passage about 7 feet wide, one side of which is formed by the ends of the rooms where the doors are, and the other side by a dead wall higher than the rooms themselves. This narrow cleft, which is crossed by arches giving access to the upper rooms, is the only source of light and ventilation on that side. The remaining two rooms open on a small sunk court.

The following table gives the details of the men's accommodation:—

Total Number of Rooms, 18.
Total Regulation Number of Non-commissioned Officers and Men, 269.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 14 | 29 0 | 20 0 | 5 2<br>10 10 | 598 | 41½ | 1<br>2<br>1 | 3 0<br>5 6<br>4 2 | 3 0<br>3 8<br>1 3 |
| 2 | 14 | 29 0 | 20 0 | 5 2<br>10 10 | 598 | 41½ | 1<br>2<br>1 | 3 0<br>5 6<br>4 2 | 3 0<br>3 8<br>1 3 |
| 3 | 14 | 29 0 | 20 0 | 5 2<br>10 10 | 598 | 41½ | 1<br>2<br>1 | 3 0<br>5 6<br>4 2 | 3 0<br>3 8<br>1 3 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 4 | 14 | 29 0 | 20 0 | 5 2<br>10 10 | 598 | 41½ | 1<br>2<br>1 | 3 0<br>5 6<br>4 2 | 3 0<br>3 8<br>1 3 |
| 5 | 14 | 29 0 | 20 0 | 5 2<br>10 10 | 598 | 41½ | 1<br>2<br>1 | 3 0<br>5 6<br>4 2 | 3 0<br>3 8<br>1 3 |
| 6 | 14 | 29 0 | 20 0 | 5 2<br>10 10 | 598 | 41½ | 1<br>2<br>1 | 3 0<br>5 6<br>4 2 | 3 0<br>3 8<br>1 3 |
| 7 | 20 | 46 6<br>12 3<br>12 0 | 21 2<br>9 7<br>4 8 | 6 0<br>10 9 | 822 | 57½ | 2<br>1<br>1 | 3 3<br>3 6<br>4 2 | 3 3<br>3 2<br>1 3 |
| 8 | 14 | 29 0 | 20 0 | 5 2<br>10 10 | 598 | 41½ | 1<br>2<br>1 | 3 0<br>5 6<br>4 2 | 3 0<br>3 8<br>1 3 |
| 9 | 14 | 29 0 | 20 0 | 5 2<br>10 10 | 598 | 41½ | 1<br>2<br>1 | 3 0<br>5 6<br>4 2 | 3 0<br>3 8<br>1 3 |
| 10 | 19 | 40 0<br>12 0 | 20 0<br>6 4 | 5 4<br>10 9 | 703 | 46 | 2<br>1 | 3 3<br>4 2 | 3 0<br>1 3 |
| 11 | 13 | 25 0 | 19 0 | 5 4<br>11 3 | 548 | 36½ | 2<br>1 | 5 6<br>4 2 | 3 8<br>1 3 |
| 12 | 14 | 25 0 | 19 0 | 5 4<br>11 3 | 509 | 34 | 2<br>1 | 5 6<br>4 2 | 3 8<br>1 3 |
| 13 | 14 | 25 0 | 19 0 | 5 4<br>11 3 | 509 | 34 | 2<br>1 | 5 6<br>4 2 | 3 8<br>1 3 |
| 14 | 14 | 20 0 | 19 0 | 5 4<br>11 3 | 407 | 27 | 2<br>1 | 5 6<br>4 2 | 3 8<br>1 3 |
| 15 | 14 | 20 0 | 19 0 | 5 4<br>11 3 | 407 | 27 | 2<br>1 | 5 6<br>4 2 | 3 8<br>1 3 |
| 16 | 14 | 20 0 | 19 0 | 5 4<br>11 3 | 407 | 27 | 2<br>1 | 5 6<br>4 2 | 3 8<br>1 3 |
| 17 | 14 | 20 0 | 19 0 | 5 4<br>11 3 | 407 | 27 | 2<br>1 | 5 6<br>4 2 | 3 8<br>1 3 |
| 18 | 21 | 48 8<br>13 8<br>12 0 | 21 0<br>12 3<br>6 8 | 6 0<br>10 9 | 873 | 60 | 2<br>1<br>1 | 3 0<br>4 2<br>3 6 | 3 0<br>1 3<br>3 2 |
| Guard Room - | 4 | 25 0 | 19 0 | 9 0<br>13 0 | 2,365 | 119 | 1<br>1<br>1 | 5 0<br>3 0<br>5 0 | 3 0<br>3 0<br>1 8 |
| Prison Cells, 3 | 1 | 9 3 | 6 6 | 9 0<br>13 0 | 1,500 | 60 | — | — | — |

*Overcrowding.*—These data show a very considerable amount of overcrowding in nearly all the rooms, both as regards cubic contents and surface area. The smallest allowance of space per man in this work ought to be that in room No. 7, namely, about 800 cubic feet. The rooms opening out of the lower narrow passage (Nos. 11 to 17 inclusive) ought to be struck off the barrack accommodation.

The following table shows the result of these changes:—

| Rooms. | Present Number of Men per Room. | Total Number of Men. | Proposed Number of Men per Room. | Total proposed Number of Men. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|---|
| No. | | | | | |
| 1 to 6 | 14 | 84 | 10 | 60 | 24 |
| 7 | 20 | 20 | 20 | 20 | — |
| 8 and 9 | 14 | 28 | 10 | 20 | 8 |
| 10 | 19 | 19 | 17 | 17 | 2 |
| 11 to 17 | 14 | 97 | — | — | 97 |
| 18 | 21 | 21 | 21 | 21 | — |
| Total - - | — | 269 | — | 138 | 131 |

*Ventilation.*—Being a purely defensible work, the amount of window space is very limited. Properly speaking there are no windows in the outer walls except embrasures

and loopholes. It would be very desirable in these rooms to enlarge the loopholes into windows provided with loopholed iron shutters for defence purposes. In most of the rooms there is a window on each side the door, facing inwards to the levels. The rooms generally are deficient in light from this circumstance. Seven of the rooms on the lower level have only three loopholes each to the outer air in the ends opposite the doors.

There are ventilating openings under the top of the arches in each at the opposite ends, showing that attention has been paid to this subject, but the means of ventilation are still deficient, and from the construction of the work it will be difficult to improve them.

The two floors of rooms differ materially in their relations to the health of the troops. The rooms on the upper floor are much dryer (except the officers' quarters), and when the stone floors are washed they become dry very soon. These upper rooms are also the best ventilated and the most healthy. The lower rooms on the contrary require a whole day to dry, marking their very defective ventilation, as well as their bad local position, and experience has proved them to be very unhealthy from rheumatism and fever. These rooms were unoccupied when we were there, mainly from their unhealthiness.

*Warming and Lighting.*—There are no fireplaces. Small oil lamps are used for lighting the rooms at night, but the oil ration lasts only three days, and the men have to buy candles for the rest of the week. Gas could be had.

*Ablution and Bath Accommodation.*—An ablution room has been formed out of one of the lower casemates. It has soft stone benches for holding basins. Water has to be carried from a pump in the small yard outside, and the foul water is poured down a grating in the middle of the floor. There are no baths.

*Cook-house.*—The cook-house is also in one of the lower casemates. It has six boilers of the old pattern, and an oven, the latter of no use because the opening is too narrow for the baking pans. Water for cooking has to be carried, and refuse water is poured down a grating in the floor, or it is carried to the privy.

*Wash-house.*—There is a wash-house for linen in another casemate, fitted with a boiler, five small Maltese stoves and a fireplace. It is considered sufficient, but there is no place for drying linen.

*Latrines.*—These are in casemates opening out of the lower level. They are of the usual Maltese construction, but have separate divisions and seats. Water is not laid on, but is poured down every morning.

*Drainage.*—The main drain of the barrack proceeds direct from the latrines down to the sea, and all the other drains are said to be connected with it. The drainage generally, at least as far as concerns the outlet, is said to be sufficient, but from want of a very simple precaution the rain-water from the upper level instead of being carried away independently, runs down into the narrow passage in front of the lower rooms, and so increases their dampness.

*Water Supply.*—Water is derived from rain-fall, which is conducted into underground tanks, and raised for use by pumps.

There is a large ashpit in a corner of the lower level. It is said to be emptied daily. An ashpit in such a confined locality is a most unnecessary risk to health, and should be removed. An iron box should be substituted for this ashpit.

*Married Quarters.*—None; but certain unoccupied barrack rooms have been from time to time allotted for this class of accommodation.

*Canteen.*—The canteen is kept in the end casemate of the narrow passage already referred to, in a barrack room, quite unfit for occupation by soldiers. It is dark and damp, but no better accommodation is available in the work.

*Guard Room and Cells.*—The guard-room is situated in a corner of a small entrance court, and has door and windows at one end. The cells open out of a passage at the end of the guard room, opposite the door. They are of the usual construction and of large size, affording 1,500 cubic feet for each inmate.

*Sanitary Improvements required.*—This work, although of recent construction, shows great disregard of the application of healthy principles to this class of barrack accommodation. Part of it is quite unfit for human habitation, and the remainder does not admit of much improvement. We would recommend as follows:—

1. The unhealthy rooms in the lower tier to be struck off the list of barrack accommodation. The number of men in the other rooms to be reduced, to give at least 800 cubic feet per man.

2. Inlets for fresh air to be provided close to the top of the arch at each end of the rooms. The loopholes to be enlarged into windows, provided with iron shutters for defensive purposes.

3. Gas to be introduced.

4. Ablution room to have water laid on.

5. Oven of cook-house to have the door enlarged, and the new steel boilers to be introduced.

6. Latrines to be reconstructed on Macfarlane's or Jennings' principle, and to have water laid on.

7. Drainage of upper level to be improved, to prevent rain-water running down to lower level.

8. Ashpit to be abolished and an iron box substituted for it.

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## 7.—Fort Ricasoli.

This is a large fort, covering a long projecting point of rock bounding the Grand Harbour on the eastern side towards the sea. It covers an area of about 18½ acres, the subsoil is soft Maltese stone, and the parade ground is about 40 feet above the sea level. The fort is isolated from all higher land, and its walls are washed by the sea for three-fourths of their circuit. So far as local position is concerned it ought to be very healthy. Occasionally there is nuisance from seaweed and other refuse which drifts into an adjacent creek, but no injury to health has been traced to this cause.

The barrack accommodation consists of two distinct parts, differing very much in construction. The principal barrack rooms are long casemates under the main land defences, on the east side of the fort. They have the arches supported towards the front by counterforts arched at the top, and about 9 feet deep. Each counterfort forms a deep narrow recess, at the upper end of which is a small window giving light to the casemate behind. Each long casemate has thus a range of windows along one of its sides at the spring of the arch, and the other side is formed by the dead wall of the defences. The lower part of each recess of the counterfort outside is formed into a very small room opening from the outer air, fitted up for married soldiers. They are very inadequate for such a purpose.

There are six long casemated rooms; four of them are arranged two and two, with a passage between them, from which a staircase gives access to some smaller rooms above and behind, very deficient both in light and ventilation, imbedded as it were in the works.

The principal rooms, although defective in window space and in ventilation, are the best part of the barracks.

The rooms in the other portion are of a different construction. They consist of a series of small casemates in the long wall bounding the south-western side of the fort. They are arranged two and two, one large and one small room side by side, with a doorway between them. They have the appearance of being in a bad state of repair. The floors irregular and below the level of the ground outside. Each casemate has a window over the door or at the side of the door, but there is a considerable space above the top of the window without any means of ventilation, in the majority of rooms. These rooms have proved unhealthy at times, partly on account of overcrowding, partly because the air in them is rendered stagnant by a long high wall carried in front of the doors and windows at a few feet only from the rooms. This wall is intended to screen the casemates from the officers' quarters which extend in a single line parallel with the wall, and at a few yards from it. Each officer's quarter has a small courtyard, between which and the parade ground there is another high wall cutting off the sea breeze from the quarters. The practical result of this effective blockade of the atmosphere from the men's rooms is that the air in and about them is stagnant, except during high winds.

Part of the men's rooms in this line are at a lower level, and are partially cut out of the rock.

The following table gives the details of each room:—

Date of Construction, time of the Knights.
Total Number of Rooms, 64.
Total Regulation Number of Men, 412.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 40 | 79 9 | 22 6 | 6 0 / 19 1 | 608 | 44 | 4 | 6 6 | 3 0 |
| 2 | 51 | 96 1 | 22 5 | 6 0 / 19 1 | 612 | 42 | 6 | 6 6 | 3 0 |
| 4 | 13 | 36 3 | 15 9 | 7 10 / 15 0 | 620 | 44 | 1 | 2 3 | 5 3 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 5 | 60 | 113 10 | 22 4 | 6 0<br>18 1 | 647 | 42 | 6 | 6 6 | 3 0 |
| 6 | 63 | 117 0 | 22 4 | 6 0<br>18 1 | 597 | 41 | 6 | 6 6 | 3 0 |
| 7 | 9 | 20 8 | 20 10 | 9 10<br>10 3 | 637 | 44 | | | |
| 8 | 7 | 17 5 | 16 1 | 9 10<br>10 3 | 576 | 40 | 1 | 9 0 | 4 2 |
| 9 | 6 | 17 3 | 15 1 | 9 10<br>10 3 | 595 | 41 | 2 | 1 10 | 4 2 |
| 10 | 9 | 20 7 | 20 5 | 9 10<br>10 3 | 637 | 43 | | | |
| 11 | 61 | 119 4 | 22 4 | 6 3<br>19 4 | 600 | 44 | 7 | 6 6 | 3 0 |
| 12 | 53 | 105 0 | 15 11 | 6 0<br>18 9 | 597 | 33 | 6 | 6 6 | 3 0 |
| 17 to 22 | Serjeants, 6 | 11 5 | 9 7 | 9 0 | 900 | 110 | 1 | 1 9 | 1 3 |
| 23 to 34 | Serjeants, 12 | 11 5 | 9 7 | 9 0 | 900 | 110 | 1 | 1 9 | 1 3 |
| 35 to 44 | Married people, 5 | 11 5 | 9 7 | 9 0 | 1,800 | 110 | 1 | 1 9 | 1 3 |
| 45 to 52 | 7 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 624 | 52 | 1<br>1 | 4 9<br>3 0 | 2 11<br>2 11 |
| Staff Serjeant | Staff Serjeant, 1 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 4,370 | 308 | 1<br>1 | 3 3<br>3 0 | 3 0<br>3 11 |
| 55 | 7 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 624 | 44 | 1<br>1 | 2 9<br>2 9 | 3 5<br>2 5 |
| 56 | 5 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 616 | 44 | 1 | 3 8 | 3 11 |
| 57 | 6 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 634 | 51 | 1 | 3 6 | 2 7 |
| 58 to 63 | 9 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 618 | 35 | 1<br>1 | 3 8<br>3 6 | 2 11<br>2 7 |
| 64 | 6 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 601 | 51 | 1 | 3 6 | 3 5 |
| 65 | Staff Serjeant, 1 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 4,680 | 308 | 1 | 4 1 | 2 2 |
| 66 | Married people, 1 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 3,560 | - - | 1 | 4 1 | 2 2 |
| 66A | Married people, 1 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 1,760 | - - | 1 | 3 0 | 3 0 |
| 67 | Married people, 1 | 17 8<br>17 7 | 8 8<br>15 7 | 4 11<br>10 6 | 6,000 | - - | 1 | 4 1 | 2 2 |
| Guard Room | 1 | 34 10 | 21 4 | 10 3<br>11 6 | — | — | — | — | — |
| Prison Cells | 1 | 17 4 | 10 5 | 5 0<br>11 0 | — | — | — | — | — |
| | 5 | 17 4 | 7 7 | 5 0<br>11 0 | — | — | — | — | — |

*Overcrowding.*—The casemates of Fort Ricasoli vary in height from 15 feet to 25 feet, one result of which is that although the cubic space per man varies from 595 to 647 feet, there is very considerable surface overcrowding. One room for 53 men gives only 33 square feet per man. From 40 to 44 square feet is the usual amount.

The small superficial area indicates that about a third of the men ought at all ordinary times to be removed out of the rooms; a measure which would improve materially the health of the troops, but it would reduce the available accommodation from 412 to 300 men.

*Ventilation.*—The table shows that the window space in all the larger casemates is much too limited, and it would add materially to the cheerfulness, no less than to the healthiness of the rooms, to enlarge the windows very considerably. The small rooms for married soldiers in the recesses of the counterforts should be removed, and the casemate windows brought nearer the ground. The windows in the small casemates in the south-east wall should be raised. A range of married quarters should be built to supply the place of the small rooms in the counterforts which we propose to abolish. The ventilation is generally imperfect, and by no means sufficient to keep the air pure. In the large casemates shafts should be carried up at intervals through the crown of the arch, and up through the terre-plein of the battery above, and inlets as high up in the

sides of the rooms as possible. In the smaller range of casemates along the south-eastern wall, a shaft should be carried up from the end of the casemate furthest from the door, and an inlet of sufficient size placed in the front directly under the arch.

*Warming and Lighting.*—There are no fireplaces. Lighting is done by small oil lamps. There is no gas available.

*Ablution and Bath Accommodation.*—The ablution accommodation is very imperfect in kind and amount. The only room at present provided is one of the casemates in the south-western wall at a considerable distance from most of the barrack accommodation. Such as it is, it requires improvement, and another and more convenient room is also needed for the other side of the fort. There are no baths. The ablution room is inconvenient and seldom used.

*Cook-house.*—There is a large cook-house situated in one of the angles of the works, in a casemate through which access is obtained to the terre-plein above. As the passages are all open the ventilation is abundant, and the kitchen quite cool. This cook-house is provided with boilers of the old pattern, but has no oven. It has no water supply.

*Latrines and Urinals.*—The latrines are situated on the northern face of the fort at about 50 yards from the nearest barrack room. Those for men and for women are close to each other. They are of the usual construction, and are flushed. They are in an underground casemate and are ventilated by a large opening in the top of the arch. The men's urinal is close to the women's privy, and there is also a cook-house for married people in the same locality. Close at hand is a place used for throwing down foul water, in a very offensive condition.

*Drainage.*—Connected with this part of the subject is that of the general drainage of the barrack. The main drains are 2 feet 6 inches wide by 5 feet high, and are cut out of the solid rock. There are branch drains from the cook-house, privies, &c., 1 foot wide by 1 foot 6 inches high. The mains have outlets into the sea on both sides of the fort, one of which, that to the north, has been a cause of great complaint on account of nuisance. The soil from the latrines is flushed through this outlet, which opens on the surface of the rock above the sea level, forming at times a large pool of foul water, from which the most offensive effluvia proceed. A cutting in the rock has been made with the view of remedying the evil, but with little success. It is stated that the summer before last, the barrack room nearest this nuisance became very unhealthy. The drainage from latrines, cook-houses, and ablution rooms should be carried away by means of glazed pipe drains not more than nine inches in diameter, and discharged into the sea by iron pipes or by covered drains cut in the rock and discharging below the sea level. The whole case belongs to the general subject of outlets which we have elsewhere considered.

During summer no fewer than 60 men are employed daily in carrying water to flush the drains; a fact quite sufficient to prove their need of reconstruction on better principles.

*Water Supply.*—Water for the fort is derived from rain-fall collected in underground tanks. Three of the principal ones had lost their water, but two had been repaired. At the time we were there, water for drinking and cooking had to be supplied by the Commissariat, and was stored in open barrels on the barrack-ground, exposed to dust and to the heat of the sun. One of the tanks yields brackish water occasionally in stormy weather. When all the tanks are repaired, the water supply will, it is stated, be sufficient as to amount, but the manner of distribution requires to be altered. In order to economize the fresh water it would be desirable to supply the latrines with salt or brackish water, pumped from the sea into a cast iron tank conveniently placed. At Fort Ricasoli a windmill for pumping might be used.

*Library and Reading Room.*—The library is formed out of three contiguous rooms in the south-western range of casemates, all communicating with each other. The reading room is in a similar casemate. They are all lighted and ventilated, and a shed has been constructed outside for the men to sit under and smoke.

*Canteen.*—The canteen accommodation is dark and very uninviting. It consists of two rooms and a yard in front. It requires very considerable improvement.

*Guard Room and Cells.*—The guard room is on one side of the entrance gate. It has ventilation, but requires more window space. There is no lock-up. There are six cells, one or two of which are very bad. Ventilation by shafts and inlets is required; but it would be better to reconstruct the cells.

*Schoolroom.*—This room is on the side of the entrance gateway opposite the guard room. It is well lighted, and appears to have been efficiently ventilated recently.

*Workshops.*—None. Barrack rooms are used instead.

There is no ball court or skittle alley.

*Sanitary Improvements required.*—1. Reducing the number of men to afford a larger amount of surface area per man, especially in the casemates along the south-eastern wall,

and providing accommodation for married soldiers in new quarters to be built for them, with wash-house and ablution room for women and children.

2. Ventilating all the casemates, as in Plan XI., and giving more window space in the manner described.

3. Suitable ablution rooms, with baths and water laid on, to be provided, Plans XV., XVI., XVII.

4. Latrines and urinals to be reconstructed on Macfarlane's or Jennings' principle, properly drained and supplied with water, Plans XII., XIII., XIV.

5. Drains from the latrines, ablution rooms, and cook-houses to be reconstructed, with means of flushing, and a proper outlet to be made into the sea.

6. Fresh water supply to be improved, and laid on for use. Salt or brackish water to be provided for the latrines.

7. Guard-room to have more window space; cells to be reconstructed; canteen to be improved.

8. Ball court to be provided.

9 Cook-houses to have the new steel boilers and ovens introduced, Plan XVIII.

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## 8.—Fort St. Salvatore.

This is a small fort situated near the north-eastern angle of the Cotonera lines, for the protection of a gate. It consists of a curtain and salients, and occupies an area of about 11,000 square yards. The surface and subsoil consists of soft sandstone. The site is elevated, and ought to be healthy.

There are two sets of barrack rooms, one consisting of short casemates in the curtain, the other of long casemates in the salients. Besides these there are several large and lofty casemates outside the fort and over the adjacent gate at present used as stores, but which might be advantageously added to the barrack accommodation.

The officers' quarters are in small casemates, with fireplaces, similar to those occupied by the men.

The following table gives the statistics of accommodation:—

Date of Construction, time of the Knights.
Total Number of Rooms, 11.
Total Regulation Number of Non-commissioned Officers and Men, 132.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 19 | 79 11 | 19 3 | 7 2<br>6 4 | 584 | 79 | 1 | 6 3 | 5 2 |
| 4 and 5 | 6 | 20 4 | 15 11 | 10 7 | 682 | 63 | 1<br>1 | 4 4<br>1 8 | 3 6<br>3 6 |
| 6 and 7 | 6 | 20 4 | 15 11 | 8 10<br>1 2 | 682 | 63 | 1<br>1 | 4 4<br>1 8 | 3 6<br>3 6 |
| 8 and 9 | 7 | 20 4 | 15 11 | 8 10<br>1 2 | 585 | 45 | 1<br>1 | 4 4<br>1 8 | 3 6<br>3 6 |
| 10 | 19 | 79 11 | 19 3 | 7 2<br>6 4 | 584 | 79 | 1 | 6 3 | 5 2 |
| 11 and 12 | 19 | 33 5<br>46 0 | 19 0<br>19 1 | 7 10<br>7 4 | 626 | 79 | Nil. | — | — |
| 1A | 56 | - - | - - | - - | 600 | - - | 3<br>2 | 7 0<br>7 0 | 4 3<br>5 3 |
| Guard Room | 1 | 21 6 | 12 11 | 4 1<br>8 11 | — | — | — | — | — |
| Prison Cells | 2 | 12 7 | 7 7 | 12 10 | — | — | — | — | — |

*Overcrowding.*—According to the table the regulation space per man varies from 584 to 682 cubic feet; and the surface area, with the exception of one room, is much greater than in most other barracks in the island; but at the time of our inspection the numbers of men per room greatly exceeded those in the table. In one of the 19-men casemates, having a door and small window over it, and an embrasure at the end, there were no fewer than 40 men. In two of the 6-men rooms there were 20 men. In consequence of this departure from the regulation there was great overcrowding throughout the fort, and all the rooms were close and very imperfectly ventilated. The number of men per room shown in the preceding table should on no account be exceeded.

*Ventilation.*—In the long casemates there are openings in the arch above intended to act as inlets, but from their imperfect construction these openings cannot always be kept open ; and when they are closed there is no ventilation worthy of the name. To remedy this defect shafts on Muir's principle, louvred above to prevent the rain beating in, should be carried up through the present openings. The smaller rooms are placed one over the other, and are connected by an inside stair. The lower floor has no ventilation except by the stair into the room above, and the outlets are in the arch of the upper room. This construction is radically defective, and the only way to remedy it is to carry up separate shafts of sufficient size from the rooms below.

In some of the larger rooms there are embrasures which have been closed; these should be reopened, and windows placed in them.

*Lighting.*—The barrack rooms are lighted by the usual small oil lamps. Gas is not available.

*Ablution and Bath Accommodation.*—There is an ablution shed built against the counterscarp of the ditch, close to the cook-house and latrines. It is not supplied with water, which has to be carried from a pump in the fort. The accommodation is of the usual kind, namely, a stone bench along the wall, on which to place the basins. There are no baths. Water should be laid on from a pump to a cistern in the ablution room, and slate slabs with basins sunk in them and a bath should be provided. The ablution shed is occasionally used as a women's wash-house.

*Cook-house.*—The cook-house has three boilers of the ordinary pattern, and an oven. It requires ventilation in the roof.

*Latrine.*—This convenience is over a cesspit, which is emptied by contract. The place is very offensive. The officers' watercloset appears to be seldom supplied with water.

*Drainage.*—The drainage of this fort is imperfectly known. The drains are carried through the works to the sea. One of the drains was very offensive.

*Water Supply.*—All the water is derived from rainfall, and is stored in tanks within the fort. Arrangements should be made for catching as much additional rain water as possible.

*Guard Room.*—The guard room is opposite the entrance. It has a door and window, and a small window over the door. It has a moveable sash, but requires hinges to enable it to be opened. There are two cells; each has a window at the back, but they require one in front also. The passage leading to the cells requires ventilation.

*Married Quarters.*—These are situated in fortini, in an adjacent curtain; they are not very good. But the accommodation would be more suitable if two adjacent fortini were given over to each family, and if a small wash-house with two boilers and two or three tubs were provided.

*Sanitary Improvements required.*—The chief defects in Fort St. Salvatore are great overcrowding above the regulation, deficient ventilation, and defective drainage.

The regulation number of men is the largest number which should ever be allowed in the rooms, and in rooms 8 and 9 the numbers should be reduced to six men per room. All the casemates should be freely ventilated, the existing outlets should be properly louvred, and additional outlet shafts on Muir's principle provided. Additional windows and inlets should be placed wherever there is room for them. Officers' quarters should be built, and their present quarters given over for men's accommodation, proper ventilation by shafts and inlets being at the same time introduced into them. The stores not otherwise required should be converted into men's quarters, the drainage should be thoroughly examined and repaired, the latrines drained and reconstructed. If sufficient water can be obtained the privies should be converted into water latrines; if not, iron boxes emptied daily should be used instead. The ablution room and cook-house should be improved, steel boilers and oven introduced, and the guard-room and cells better ventilated.

## 9.—Fort St. Angelo.

This fort occupies the summit and sides of a rocky promontory forming the western point of the peninsula on which Vittoriosa is situated. It projects into the middle of the Grand harbour, and is nearly surrounded by water. The position is a very healthy one, and fully exposed to the sea breeze. On account of the irregular form of the rock the barracks are at different elevations, and have been constructed wherever space could be most conveniently found, without much regard to regularity of plan. The different ranges are connected by narrow ramps and steps, and all the rooms are small, with space for a very few men in each. The area within the walls is about 25,000 square yards, and the surface and subsoil consist of porous sandstone rock. There is one principal range of soldiers' rooms (1 to 7) containing 14 small apartments connected two and two

by a door through the wall. Each pair of rooms opens from an enclosed court in front, from which a small space intended for cooking is walled off. The front walls of these courts are as high as the rooms. The courts are quite unnecessary and useless, while the walls and cross walls interfere most injuriously with the ventilation of the rooms, and should therefore be removed. There are similar walls in front of other rooms in the other blocks, which should also be taken down.

Some of the rooms are on two floors, and are reached at two levels. The lower rooms are built against the rock, and have doors and windows only in front, while the rooms above have doors and windows on opposite sides. The rooms are rather crowded, as in the majority of instances they afford considerably under 600 cubic feet per man.

The following table gives the statistics of the barrack accommodation:—

Date of Construction, time of the Knights.
Total Number of Rooms, 16.
Total Regulation Number of Men, 118.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 8 | 14 0<br>12 11 | 13 0<br>8 9 | 5 8<br>10 4 | 520 | 37 | 2 | 3 3 | 2 3 |
| 2 | 8 | 14 0<br>12 11 | 13 0<br>8 9 | 5 8<br>10 4 | 520 | 37 | 2 | 3 3 | 2 3 |
| 3 | 8 | 13 0<br>12 11 | 12 11<br>8 8 | 5 8<br>10 4 | 511 | 35 | 2 | 3 3 | 2 3 |
| 4 | 8 | 13 1<br>13 0 | 12 11<br>8 8 | 5 8<br>10 4 | 516 | 35 | 2 | 3 3 | 2 3 |
| 5 | 8 | 13 1<br>13 0 | 12 11<br>8 8 | 5 8<br>10 4 | 516 | 35 | 2 | 3 3 | 2 3 |
| 6 | 8 | 12 11<br>12 10 | 13 2<br>8 7 | 5 8<br>9 8 | 619 | 43 | 2 | 3 3 | 2 3 |
| 8 | 7 | 12 11<br>13 0 | 13 1<br>8 8 | 5 8<br>9 8 | 545 | 35 | 2 | 3 3 | 2 3 |
| 9 | 7 | 12 11<br>13 0 | 13 1<br>8 8 | 5 8<br>9 8 | 545 | 35 | 2 | 3 3 | 2 3 |
| 10 | 1 Staff Sergeant | 13 0<br>13 0 | 12 0<br>7 9 | 4 3<br>9 7 | 3,501 | 257 | 2 | 3 3 | 2 3 |
| 11 | 1 Married Serjeant | 13 0 | 13 0 | 4 3<br>9 7 | 2,329 | 169 | 1<br>1 | 3 3<br>1 9 | 2 3<br>1 5 |
| 12 | 7 | 17 4 | 15 0 | 6 0<br>10 10 | 609 | 37 | 2 | 3 3 | 2 3 |
| 13 | 10 | 14 0<br>13 8 | 13 2<br>13 10 | 6 6<br>10 10 | 587 | 37 | 2 | 3 3 | 2 3 |
| 14 | 9 | 12 10<br>12 9 | 13 0<br>13 9 | 6 6<br>10 2 | 569 | 35 | 2 | 3 3 | 2 3 |
| 15 | 10 | 13 6<br>15 3 | 13 0<br>14 0 | 6 6<br>10 2 | 542 | 37 | 2 | 3 3 | 2 3 |
| 16 | 10 | 12 10<br>13 0 | 13 9<br>12 6 | 6 1<br>8 9 | 527 | 35 | 2 | 3 3 | 2 3 |
| 17 | 10 | 13 0<br>13 3 | 13 9<br>13 0 | 6 4<br>10 4 | 535 | 35 | 2 | 3 3 | 2 3 |
| Guard Room | 1 | 37 0 | 19 1 | 9 6<br>15 0 | — | — | — | — | — |

*Overcrowding.*—The rooms differ in character. Some are better than others, but all of them would be more adapted, from their construction, for married quarters than for barrack rooms. Generally they have not sufficient space for tables, &c., and the tables are placed in the small courts in front. The superficial area per man is much too small, but, on the other hand, the position is exposed to every healthy wind, the barrack is only a small one, and the quarters are not all in the same block, so that there is better external ventilation. Any way there is not convenient accommodation for more than about two-thirds of the present regulation number, or for about 80 men.

*Ventilation.*—The only means of ventilation are the doors and one or two small windows, except in the rooms built against the rock; and as these rooms have no window behind, a large shaft has been carried up from the top of the arch opposite the door, intended to act as an outlet. These shafts open on the passage leading to the upper rooms, close to their doors. It would improve the ventilation of all the rooms to enlarge the windows, and to provide them with proper sashes, instead of the boards which are used for many of them at present.

Permanent ventilating arrangements are also necessary. As long as the present windows and doors are kept open the air is fresh enough, but when they are closed the air becomes very foul. The only way to avoid this is to provide each room with properly constructed shafts and inlets.

*Warming and Lighting.*—There are no fireplaces. This defect is common to nearly all the barrack rooms in the garrison. If provided they would not only enable the rooms to be kept free of damp in moist weather, but they would be advantageous to the room ventilation at all other times.

Lighting is done by small lamps supplied with an insufficient oil ration; and the men are obliged to buy candles after the ration is consumed.

*Ablution and Bath Accommodation.*—There is a small ablution room, with washing troughs of stone against the walls on two of its sides. These troughs have holes to allow the water to escape, and plugs. There is no water laid on. The arrangements are very defective, and ought to be replaced by slate tables with sunk basins and water laid on. There are no baths.

*Cook-house.*—The cook-house consists of a small arched room with no opening except the door. It has four ordinary pattern boilers, and a stone oven for burning wood. These should be changed for improved steel boilers and oven. The cook-house should have a drained sink with water laid on. At present water has to be carried from the pump, and refuse water is thrown down a drain outside.

*Wash-house.*—All the washing for the fort has to be done in a small, irregularly shaped, dull room, without any conveniences for the purpose. Two small boilers with a few fixed washing troughs should be provided.

*Latrines and Drainage.*—The latrines are situated in the end compartment of the court, in front of No. 7 room, and in contact with its wall. The place is insufficiently ventilated. The latrines are of the usual construction, and require the same improvements as the others. The main drain of the fort runs direct from the privy to the sea, and all the other drains are connected with it. One of these was in a very offensive state, and tainted the air to some distance. The latrines, ablution room, cook-house, &c., should be drained to the sea by glazed earthenware pipes.

The whole drainage requires to be examined and rectified.

There is an offensive ashpit at one end of the main range of barracks, which ought to be entirely removed, and an iron box supplied instead, and provision made for daily carrying away the refuse.

*Water Supply.*—The water supply is all derived from rain-fall stored in tanks. No other source is available. The latrines, when reconstructed, should be supplied with salt water by a pump, and flushed out sufficiently often to keep them free of offensive odour.

*Guard Room.*—This is a casemate at the entrance gate. The lock-up is merely a bunk taken off it. There is no ventilation.

*Married Quarters.*—There are none specially appropriated, but several small soldiers' rooms are set apart for married people. The mess kitchen was also occupied by married people.

*Officers' Quarters.*—The officers' quarters occupy the highest ground in the fort. They have several small gardens attached to them, and are generally good.

*Sanitary Improvements.*—The chief improvements required for this fort are, as will be seen, diminution of overcrowding, improved ventilation, water supply and drainage, and improved accommodation as to latrines, ablution rooms, cook-house, and wash-house, in the manner already mentioned. To effect the necessary diminution of overcrowding, it will be requisite to build quarters for 40 men on the best available site. Part of the garden of the upper fort would be a good place if it could be spared.

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## 10.—Verdala Barracks.

These barracks constitute a large work at the upper end of a steep slope rising from the top of Dockyard Creek towards the inner line of works at Burmola. The slope of the hill below is densely covered with a poor crowded class of dwellings coming close up to the barracks, and the works beyond rise above the level of the barracks, so that they cannot be said to be advantageously situated for free external ventilation.

Fort Verdala was built in 1853, and, notwithstanding some defects, it is one of the best barracks in Malta. The general outline of the plan is that of a curtain with salients. The public gate passes through the centre of the curtain. Seen from the outside, the barracks have the appearance of a loopholed fort, and it is only from the interior of the fort that their construction becomes visible.

They consist of a series of casemated rooms all of the same size, and in two floors. In front of the lower floor there is an arched covered verandah, 5 feet 2 inches wide, above which is an open terrace 6 feet 3 inches wide, reached by stairs at the corners, and affording means of access to the rooms on the upper floor. The ends of the room arches are towards these terraces, and have a door and one window, and in some instances two windows, to the open air. At the end of the arch opposite the door are three loop-holes.

The parade ground enclosed among the barrack ranges is irregular in shape, following in this respect the outline of the fort. Opposite the curtain it is a long narrow strip of ground. In one of the salients it is nearly triangular in form, and in the other salient it consists of two irregular squares, chiefly occupied by officers' quarters. The parade ground is completely enclosed by walls or by higher levels, and its form is not well adapted for securing free ventilation. The total area within the fort, including the space covered by buildings, is 4⅓ acres. The subsoil is sandstone rock.

The following table gives the statistics of the accommodation:—

Total Number of Rooms, 90.
Total Regulation Number of Men, 690.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1, 2, 3, 4, 5, 6, 7, 12, 13, 14, 15, 16, 20, 21, 22, 23, 24, 25, 29, 30, 31, 32 | 10 | 24 0 | 17 6 | 5 0<br>9 0 | 489 | 42 | 2<br>3 | 4 10<br>1 3 | 3 2<br>0 3 |
| 8 | 1 Staff Serjeant | 24 0 | 17 6 | 5 0<br>9 0 | 4,896 | 420 | 2<br>3 | 4 10<br>1 3 | 3 2<br>0 3 |
| 33, 34, 35, 36, 37, 38, 39, 40 | 10 | 24 0 | 17 6 | 5 0<br>9 0 | 489 | 42 | 1<br>3 | 6 3<br>1 3 | 5 2<br>0 3 |
| 42 | Serjeant-Major | 24 0 | 17 6 | 5 0<br>9 0 | 4,896 | 420 | 1<br>3 | 6 3<br>1 3 | 5 2<br>0 3 |
| 45 | Quartermaster-Serjeant | 24 0 | 17 6 | 5 0<br>9 0 | 4,896 | 420 | 1<br>3 | 6 3<br>1 3 | 5 2<br>0 3 |
| 46, 47, 48, & 49 | 2nd Class Staff-Serjeant | 24 0 | 17 6 | 5 0<br>9 0 | 4,896 | 420 | 1<br>3 | 6 3<br>1 3 | 5 2<br>0 3 |
| 51, 52, 53, 54, 55, 56, 57, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 71, 72, 73, 74, 75, 76, 77, 80, 81, 82, 83 | 10 | 24 0 | 17 6 | 5 0<br>9 0 | 489 | 42 | 1<br>3 | 6 1<br>1 3 | 2 11<br>0 3 |
| 84, 85, 86, 87, 88, 89, 93 | 10 | 24 0 | 17 6 | 5 0<br>9 0 | 489 | 42 | 1<br>3 | 6 1<br>1 3 | 2 11<br>0 3 |
| 90, 91, 92, & 94 | 10 | 24 0 | 17 6 | 5 0<br>9 0 | 489 | 42 | 1<br>3 | 6 3<br>1 3 | 5 2<br>0 3 |
| 1 to 10 | Officers' servants, 2 | 24 0 | 17 6 | 5 0<br>9 0 | 2,448 | 210 | 1<br>3 | 6 3<br>1 3 | 5 2<br>0 3 |
| 11, 12, & 13 | Staff-Serjeant | 24 0 | 17 6 | 5 0<br>9 0 | 4,896 | 420 | 1<br>3 | 6 3<br>1 3 | 5 2<br>0 3 |
| F.O. servant | F.O. servant | 24 0 | 17 6 | 5 0<br>9 0 | 4,896 | 420 | 1<br>8 | 6 3<br>1 3 | 5 2<br>0 3 |
| Guard Room | 1 | 24 0 | 17 6 | 5 0<br>9 0 | — | — | — | — | — |
| Prison Cells | 2 | 10 0 | 6 4 | 5 0<br>9 0 | — | — | — | — | — |
| | 3 | 7 5 | 6 4 | 5 0<br>9 0 | — | — | — | — | — |

*Overcrowding.*—It will be observed that the rooms are no more than 17 feet 6 inches wide, leaving only a small space between the opposite beds; and when the beds are folded down the forms have to be placed on the top of the tables; so that the men have no means of reading, writing, &c., during the evening. The table also shows a very considerable degree of overcrowding in all the men's rooms, both in cubic space and superficial area, even at the regulation number of 10 men per room; but when the return was made up the actual number was 12 men per room, a degree of overcrowding seldom

reached even at home. It is easy to understand why the troops in this barrack have suffered from fever; and it is certain to recur, unless the overcrowding is diminished. There should be no more than 8 men per room, at the very most, to give anything like adequate space for the inmates.

The effect of this reduction on the accommodation would be as follows:—

| Rooms. | Present Number of Men per Room. | Total Number of Men. | Proposed Number of Men per Room. | Total Number of Men. | Deficiency of Accommodation in Men. |
|---|---|---|---|---|---|
| No. 69 | 10 | 690 | 8 | 552 | 138 |

*Ventilation.*—Besides the doors, windows, and loopholes, every room has a foul-air shaft carried up in the back wall, having an area of 2 feet by 16 inches, and an opening over the door 13 inches long by 6 inches wide. These means are, however, insufficient to preserve the requisite purity of the air at night with the present number of occupants. The inlet should be enlarged, and furnished with louvres arranged to throw the air-current up to the roof of the room. There is, besides, a shutter over the shaft capable of being closed, and which no doubt is almost always closed. This shutter should be removed, and the lower end of the shaft louvred so as to throw any down-draught towards the ceiling. The windows are circular headed, and although they are made to take out, the circular heads are not hinged so as to open without being removed. These improvements would add materially to the facilities for ventilation, but no permanent good will be done in this respect so long as the overcrowding continues.

It would be an additional improvement in these barracks to introduce windows in place of loopholes, the windows to be provided with loopholed iron shutters, which could be closed for defence when necessary. Iron shutters would resist shot as effectually as the soft friable Maltese stone; and the introduction of windows would improve the salubrity of the rooms.

*Ablution and Bath Accommodation.*—There are, three ablution rooms, exactly like barrack rooms having a stone bench down one side, and metal basins. Water is not laid on, but has to be carried by a fatigue party. A board which sat recently, recommended one of these rooms to be converted into a barrack room. There are no baths, and the existing means of cleanliness are not sufficient.

*Cook-houses.*—These are two in number, and are of the same size as the barrack rooms. Each cook-house has 16 boilers, of the old pattern, but no oven. The rooms are not adapted for cook-houses, on account of its being impossible to ventilate them sufficiently; and the mens' rooms above them cannot be used as barrack rooms on account of the high temperature. Water is not laid on, but has to be carried. Refuse water is poured down a drain in the floor.

*Women's Wash-house.*—This is also a room of the same size as the barrack rooms. It has washing benches and two boilers. The drying ground is on the rampart. The accommodation is stated to be insufficient for the strength in barracks.

The ablution rooms, cook-houses, and wash-house are quite out of place where they are. It would be much better to build them in some detached locality, as has been done with the latrines, and to convert the present rooms to other purposes. It is not safe in a barrack like this to have so much damp surface and heat among the barrack rooms.

*Latrines and Urinals.*—These are in a detached block by themselves; they are of the usual construction, but are not sufficiently ventilated. The urinals are of a clumsy form. The supply of water for the latrines is derived from a tank filled by a force-pump; but as the tank from which the supply is obtained is too small, water runs short, and it is necessary to employ fatigue parties to fill carts with salt water from the creek eight times daily to flush the latrines. This is a great evil, and ought to be remedied.

*Drainage.*—The barrack drainage is collected in two main sewers, the largest of which is 2 feet wide and no less than 10 feet high, cut in the solid rock and arched with stone. The drainage is finally discharged into the town sewers of Burmola, and thence into Dock-yard creek, half a mile distant. All the openings into these drains are trapped. The surface drainage is sufficient except in very wet weather, when, from the gratings becoming choked with sand, the rain flows over the surface, and has to be swept away by fatigue parties. This defect should be remedied. One main drain passes under a barrack room. This should be altered. The surface drains are swept out three times a day, and any refuse is thrown into the ash-pit, from whence it is removed by the con-

tractor every day. This ashpit should be abolished, and all refuse collected in an iron box, and removed by the contractor, as at present.

*Water Supply.*—The water supply is derived from two tanks within the barrack precincts. It is not sufficient in amount.

*Stables.*—The stables are in the square, and occupy the space of two soldiers' rooms, divided into 12 stalls; there are forage stores and pay office over them. The dung heap is close to the officers quarters; the manure is removed every alternate day. The stables are ventilated by four shafts carried up to the roof of the barrack. These stables are in a most objectionable position for the healthiness of the barracks. They should be removed and placed outside the fort.

*Married Quarters.*—None; except for two staff serjeants.

*Officers' Quarters.*—The officers' quarters are good, but not very light. They are ventilated in the same manner as the soldiers' rooms. The mess room is over the mess kitchen, and during the summer months the heat in the mess room is almost unendurable. The kitchen requires thorough roof ventilation to carry off the hot air. There are no quarters for the commanding officer, surgeon, quartermaster, and adjutant, who live at a distance, although constantly required in barracks. It is stated to be almost impossible to obtain decent lodgings in the neighbourhood. The commanding officer was living two miles, and the surgeon upwards of one mile away, because they could get no suitable accommodation nearer at hand.

*Library, Reading Room, &c.*—The only accommodation of this kind at present consists of two barrack rooms taken away from the men. Another room is used for an infant school. The tailors' and shoemakers' shops and the canteen are also in barrack rooms.

A fives-court has been recently constructed in the ditch.

*Sanitary improvements required.*—1. All the misappropriations to be restored to the barrack accommodation. The cook-rooms and ablution rooms to be placed in a detached building within the fort, but not in the square. The stables to be removed. A separate building for a reading and day room, with a coffee bar between them, to be erected outside, and if possible between the Cotonera and St. Marguerita lines, or, if not objectionable, in the ditch. The infant school and canteen to be removed to the same position. The rooms now occupied for these purposes to be restored to the barrack accommodation. Misappropriations for any purpose are indefensible while the men are crowded to such an extent as they are in these barracks. Every barrack room should have no more than eight men in it, instead of 12 the actual number. Married soldiers' quarters for the regulation number should be provided on the plan we have already described outside the fort. The infant school should be attached to them, and also a women's wash-house and an ablution room. Accommodation for sick women and children could be best provided in the manner already recommended.

2. Ventilation of men's rooms and officers' mess kitchen to be improved in the manner suggested above.

3. A new ablution and bath room to be provided, Plan XVII.

4. A new cook-house, light and well ventilated, to be built, and provided with a Benham's cooking apparatus, or else with the new steel boilers and oven, Plan XIX.

5. Women's wash-house, Plan IX, to be built at the proposed married quarters.

6. Latrines to be reconstructed on Macfarlane's or Jenning's principle, and supplied with sufficient water. Urinals to be improved, Plans XII., XIII., XIV.

7. Drainage to be revised, and glazed earthenware pipes used for sewers.

8. Ashpit to be abolished and iron box substituted.

9. Water supply to be increased. Lastly, plans should be prepared for providing the quarters and other accommodation at present deficient in a manner consistent with health.

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### 11.—St. Elena Gate Barracks.

These barracks are built in a curtain on each side of the gate, about 500 yards from Fort Verdala. The ground at this point falls on both sides into a ravine, in the bottom of which the gate is situated; and the barrack rooms are, therefore, on different levels. There is an officers' quarter and six barrack rooms on each side the gate. The rooms are casemates, with the arches at right-angles to the curtain. They have each three windows in front; two of these are closed by shutters merely, and the other, which is near the roof, is arched. On account of the slope of the ground, the casemates vary in height. Those nearest the gate are very lofty, while those at the top of the slope are about 12 feet high. Each set of six rooms has only one entrance, and all the rooms communicate with the one where the entrance door is by flights of steps. These barracks form one side of a narrow densely peopled street, and are not well situated for external

ventilation, while all the rooms on each side the gate communicate with each other. The construction and position are therefore both unfavourable.

*Overcrowding.*—The casemates are each 30 feet long by 18 feet wide. They differ in height from 12 feet to about double that height; and each is intended to hold 16 men. This gives about 34 square feet per man, with an effective cubic space of from 350 to about 500 feet.

The total accommodation is for 4 officers and 200 men. The place should not contain above 100 men. The rooms are stated to be generally damp.

*Ventilation.*—The means of ventilation provided are, the windows already mentioned, and a ventilating shaft at the back, carried up into the parapet: these means are far from being sufficient. The only remedy for this defect is to enlarge all the windows and glaze them, and to provide permanent louvred inlets for air at the top of the wall next the street, close to the crown of the arch. The new windows should all be made to open.

*Ablution and Bath Accommodation.*—There is no ablution room, and the men are said to wash in their rooms or in the street in front. There is no bath.

*Cook-house.*—The cook-house is in one of the upper casemates. It has boilers, but no oven. It is ventilated through the roof.

*Latrines.*—The latrines are of the usual construction, and are situated at the top of one of the slopes, higher up than the cook-house. The place requires more light and ventilation. There are urinals constructed of porous stone, and offensive.

*Water Supply.*—This is obtained from a tank at the gateway.

*Sanitary Improvements required.*—This is a bad barrack, and not much can be done to improve it. Each man should have from 65 to 70 square feet of surface. The windows should be enlarged and glazed, inlets for fresh air provided, as already described; an ablution and bath-room built, steel boilers and oven provided for the cook-house, and proper latrines supplied with water, and having more light and ventilation, should be constructed instead of the present defective arrangements.

## 12.—Zeitun Gate Barrack.

This is a small bad barrack for 41 men, situated in one of the curtains of the Cotonera lines. There are no buildings near it to interfere with the external ventilation, but otherwise it is hardly suitable for troops. It consists of three casemates; the centre one of which appears to have been intended for the gateway, although now a barrack room, with rooms over them for officers' quarters. The guard-room is part of the centre casemate, cut off by means of a partition.

The following table gives the accommodation:—

| Rooms. | Number of Men per Room. | Dimensions. | | | Cubic Feet per Man. | Superficial Feet per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 15 | 32 9 | 23 0 | 9 7<br>9 9 | 600 | 50 | 2 | 4 1 | 2 10 |
| 2 | 15 | 31 9 | 19 5 | 9 7<br>9 9 | 600 | 41 | 2 | 4 1 | 2 10 |
| 3 | 11 | 27 0 | 21 0 | 6 0<br>20 6 | 636 | 51 | None. | — | — |
| Guard Room - | 1 | 20 10 | 8 5 | 6 0<br>20 6 | — | — | None. | — | — |

*Ventilation.*—There are no means of ventilation properly so called. The centre casemate has no openings to the outer air except the door and the slits in the escarp originally intended for giving passage to the beams of the drawbridge. This room is still further darkened by the guard room, which is taken off it at the doorway. The other rooms have small windows over the door, but no other openings. All the rooms require more light and ventilation. The centre room should have a large window between the slits, and a shaft carried above the parapet. The other rooms also require shafts and larger windows. All the rooms should have permanent louvred inlets for the outer air near the crown of the arch.

*Ablution and Bath Accommodation.*—None.

*Cook-house.*—This is a small temporary building with two boilers. It has no means of ventilation except the door and window. Water has to be carried from a tank about 50 yards distant.

*Latrines and Urinals.*—The latrines are also of a temporary description. They are very bad and offensive, and have no drainage except into a cesspit. This arrangement was introduced in 1856, since which time the cesspit has not been cleansed. The urinals are of temporary construction likewise.

*Drainage.*—There is, properly speaking, no drainage. The surface and refuse water flows through a drain towards the foot of St. Clement's glacis, and empties itself into a large hollow space of ground about 250 yards from the barrack. Nothing can well be worse than such an arrangement. The drainage, such as it is, sometimes becomes choked after heavy rains.

To make this barrack what it ought to be would require a larger outlay of money than the place is worth. If it must be kept up, the rooms should all be better ventilated by louvred shafts and louvred inlets, and lighted by constructing windows and enlarging those already existing; an ablution room should be provided; the cook-house should have steel boilers and oven; the latrines should be reconstructed with Macfarlane's apparatus, supplied with water and drained, but if there be no outlet the latrines should be constructed to be flushed out daily into a cart. As extensive works are being carried out at no great distance in which drainage will be required, it is probable that the drains of this small barrack might be connected with them.

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## 13.—Isola Gate Barracks.

These barracks are situated at the south-eastern point of Senglea, on sloping ground close to Dockyard Creek; they are for the protection of the gate, and their construction has been made conformable to this object without reference to health. The rooms are enclosed among high walls which effectually obstruct the outer ventilation, and they are otherwise so embedded in the works as to render efficient internal ventilation all but impossible. They consist of three sets of casemates, one on the right-hand side of the gate, another on the left-hand side, and the third in a salient commanding the approaches to the gate.

The barrack rooms at the gate consist of four casemates, two on either side, which have been divided by floors into two rooms each. The upper floors in two casemates are reached by an outside gallery, and in the two others by separate staircases, one of which is entered from without, and, in the other case, from within the lower barrack room. In this latter instance the foul air from the room below is carried direct by the staircase into the room above.

The casemates in the salient contain one room each; the casemates on the left side of the gate have a small court in front of them, on the side of which, opposite to the rooms, are two floors of smaller rooms, used as the guard room, canteen, and non-commissioned officers' quarters. In one corner of this Court, and in full view of the barrack rooms, a latrine has been constructed for the women.

There is also a narrow court in the front of the casemates to the right of the gate. The latrines are in one corner of this court, and from one end of it a passage leads through the salient down to the ditch, in which the cook-house, wash-house, &c. are situated.

The following table gives the statistics of the barrack accommodation:—

Date of Construction, time of the Knights.
Total Number of Rooms, 15.
Total Regulation Number of Men, 277.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 27 | 61 4 | 22 5 | 12 7 | 600 | 50 | 1 | 3 9 | 2 5 |
| 2 | 24 | 56 10 | 22 6 | 11 10 | 619 | 70 | 1 | 3 9 | 2 5 |
| 3 | 16 | 65 2 | 22 3 | 9 7 | 625 | 89 | 2 | 4 6 | 3 3 |
| 4 | 16 | 65 2 | 22 3 | 9 7 | 625 | 89 | 2 | 4 6 | 2 3 |
| 5 | 25 | 62 9 | 22 4 | 11 6 | 600 | 55 | 1<br>1 | 3 10<br>5 3 | 3 1<br>5 1 |
| 6 | 20 | 62 8 | 22 2 | 10 3<br>11 6 | 613 | 68 | 1 | 6 0 | 4 9 |
| 7 | 20 | 62 8 | 22 2 | 10 3<br>11 6 | 613 | 68 | 1 | 6 0 | 4 9 |
| 8 | 19 | 43 9 | 22 3 | 12 0 | 625 | 49 | 1 | 3 9 | 2 5 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 9 | 38 | 78 0 | 20 4 | 10 9<br>11 10 | 603 | 51 | 1 | 2 6 | 22 0 |
| 11 | 24 | 50 6 | 21 0 | 10 3<br>12 6 | 600 | 44 | 1<br>1 | 6 0<br>5 0 | 4 8<br>5 1 |
| 12 | 24 | 46 4 | 20 10 | 10 3<br>12 6 | 600 | 39 | 1 | 7 0 | 4 6 |
| 13 | 24 | 39 6 | 27 8 | 15 1<br>7 4 | 604 | 45 | 2 | 3 10 | 2 1 |
| 18 | 1 Colour Serjeant | 11 2<br>12 0 | 14 4<br>10 6 | 12 0 | 2,376 | 285 | 1 | 6 3 | 3 2 |
| 19 | 1 Colour Serjeant | 24 0 | 17 2 | 12 0 | 2,376 | 408 | 1 | 6 3 | 3 2 |
| 21 | Orderly Room Clerk | 13 0<br>10 2 | 9 10<br>10 0 | 12 0 | 2,070 | 228 | 1 | 6 3 | 3 2 |
| Guard Room | 1 | 23 0 | 15 0 | 6 0<br>11 6 | — | — | — | — | — |
| Prison Cells 2 | - - - | 16 0 | 9 6 | 1 0<br>14 1 | — | — | — | — | — |

*Overcrowding*.—The rooms are considerably overcrowded, for although the average cubic space per man somewhat exceeds 600 feet, the allowance is far from sufficient in such a barrack, and especially in such a climate. We have given the available accommodation in the following table, but the best way to use such a barrack is to have as few troops in it as possible. For the purposes of sufficient guard it must be occupied but it should not be considered as a place in which men are to be crowded.

| Rooms. | Total present Number of Men in the Rooms. | Total proposed Number of Men in Rooms. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| No. | | | |
| 1 | 27 | 20 | 7 |
| 2, 3, 4 | 56 | 56 | — |
| 5 | 25 | 20 | 5 |
| 6, 7 | 40 | 40 | — |
| 8 | 19 | 15 | 4 |
| 9 | 38 | 32 | 6 |
| 11 | 24 | 18 | 6 |
| 12, 13 | 48 | 30 | 18 |
| Total - - | 277 | 231 | 46 |

*Ventilation*.—The means of light and ventilation are extremely deficient. The four lower rooms at the gate have each an embrasure at the end opposite the door. In two or three rooms there are small windows over the door; but one embrasure per room (accommodating from 20 to as many as 38 men) is the only source of light except the door.

In several rooms there are serjeants' bunks close to the doorway, still further obstructing the light and ventilation. In some of the rooms ventilating openings have been made through the roof, but they are of very little use. They should be enlarged and supplied with shafts on Muir's principle. Some of the rooms are quite dark and some are very damp. If these barracks must be occupied, it is absolutely necessary that additional window space should be obtained by enlarging the embrasures into windows carried up to the upper parts of the rooms.

The serjeants' bunks should be removed out of the rooms, and ventilating openings introduced wherever an available current of air can be obtained.

These openings should be partly shafts through the roofs and partly inlets through the walls. The whole construction of the barrack is so complicated, that it can be efficiently ventilated only by careful study, and by increasing the number of openings until the air is found to be pure night and day.

*Ablution and Bath Accommodation*.—The ablution room is an open shed, formerly a women's wash-house. Water has to be carried to it from a pump 50 yards distant. There are no baths. The whole arrangements are extremely imperfect and require reconstruction, with water laid on to the basins.

*Cook-house.*—The cook-house is in the ditch. It has eight boilers and an oven. It is at a considerable distance from the men's rooms. It requires steel boilers and oven, also roof ventilation.

*Wash-house.*—There is no women's wash-house; and the means of drying linen are stated to be insufficient.

*Latrines.*—The latrines are in the ditch; they are of the usual construction, and are flushed through a drain into the harbour. They require reconstruction.

*Drainage.*—The drainage is stated to be imperfect and imperfectly known.

*Water Supply.*—The water supply is derived from a rain-water tank, into which water from the town aqueduct can be turned to supply any deficiency.

*Cells.*—There are two cells cut out of the solid rock. They are quite unfit for occupation except for a few hours. They require more ventilation. The latrine belonging to them is over a drain, but is not supplied with water.

There are no workshops.

*Sanitary Improvements required.*—This barrack is so very defective that it would be merely a waste of money to try to make it suitable for 280 men. It would be far better as well as less costly to build a healthy barrack on the most convenient site available; but in the meantime the improvements suggested above should be carried out.

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## 14.—St. Francesco di Paola, Cospicua.

This barrack consists of a large cube of casemated building, situated in an angle of St. Margarita lines, near the head of French creek. It is built on sloping ground close to a densely peopled neighbourhood. The barrack accommodation consists of four long casemates, three of which have embrasures at opposite ends, and the fourth has an embrasure at one end only. These four casemates are each on two levels on account of the slope of the ground. The floors of the lower end are sunk many feet below the level of the floors at the upper end, so that the four casemates form eight barrack-rooms, all communicating with each other. There is a low parapet wall, dividing the upper from the lower portions, which latter can be overlooked by the men above. Access is obtained to each level by a single door, and there are openings in the division walls to enable the rooms farthest from the door to be reached. On the side facing the public street a number of small rooms for non-commissioned officers have been built against the wall of the outer casemate. These rooms have a window on one side and a ventilating shaft at the opposite side. The rooms are on two levels. Those on the upper level open into each other; some of the lower rooms are used for the canteen, and the remainder for married soldiers. The ventilation of one of the lower rooms is carried into the one above it. There is a bastion below the lower level, along one side of which are several small cells used for prisoners; and other small casemates used for various purposes. At right angles to this row there are two floors of small rooms formerly used as officers' quarters, &c., but now partly converted into quarters for married soldiers, cook-house, &c. These rooms have a window at one side, with a ventilating shaft in the opposite wall.

The total area occupied by the work is 5,245 yards, and the subsoil is sandstone rock.

The following table shows the accommodation:—

Date of Construction, time of the Knights.
Total Number of Rooms, 15.
Total Regulation Number of Men, 149.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 22 | 51 4 | 19 0 | 9 0<br>9 0 | 667 | 44 | Nil. | — | — |
| 2 | 27 | 63 10 | 19 0 | 9 0<br>9 0 | 620 | 45 | 1 | 6 6 | 2 1 |
| 3 | 27 | 60 8 | 19 0 | 9 0<br>9 0 | 601 | 43 | 1 | 6 6 | 2 1 |
| 4 | 23 | 58 4 | 14 9 | 9 0<br>9 0 | 600 | 37 | 1 | 6 6 | 2 1 |
| 5 | 1 Married Non-commissioned Officer | 14 10 | 8 8 | 6 0<br>6 2 | 2,178 | 128 | 1 | 3 7 | 1 11 |
| 6 | 1 Married Non-commissioned Officer | 23 3 | 11 6 | 6 0<br>6 2 | 2,178 | 128 | 1 | 3 7 | 1 11 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in | | | | Ft. in. | Ft. in. |
| 7 | 1 Married Non-commissioned Officer | 17 7 | 12 0 | 6 0<br>6 2 | 1,836 | 198 | 1 | 3 7 | 1 11 |
| 8 | 1 Married Non-commissioned Officer | 22 10 | 11 7 | 6 0<br>6 2 | 2,178 | 128 | 1 | 3 7 | 1 11 |
| 9 | 1 Married Non-commissioned Officer | 22 5 | 11 8 | 6 0<br>6 2 | 1,836 | 198 | 1 | 3 7 | 1 11 |
| 12 | 5 | 21 2 | 11 9 | 18 9 | 646 | 50 | 1 | 3 6 | 3 0 |
| 13 | 1 Staff Serjeant - | 14 3 | 8 9 | 18 9 | 1,890 | 126 | 1 | 5 6 | 2 3 |
| 14 | 17 | 39 4 | 19 0 | 11 0<br>17 0 | 610 | 44 | 1 | 5 9 | 2 3 |
| 15 | 15 | 36 2 | 19 0 | 11 0<br>17 0 | 638 | 46 | 1 | 5 9 | 2 3 |
| 16 | 7 | 34 6 | 19 0 | 11 0<br>17 0 | 660 | 71 | 1 | 5 9 | 2 3 |
| 17 | 11 | 31 6 | 17 4 | 11 0<br>17 0 | 649 | 48 | 1 | 3 6 | 2 2 |
| Guard Room - | 1 | 21 7 | 17 3 | 0 9<br>10 0 | — | — | — | — | — |
| Prison Cells 3 | — | 11 5 | 10 10 | 0 11<br>9 10 | — | — | — | — | — |
| Prison Cells 2 | — | 21 8 | 17 4 | 0 11<br>9 10 | — | — | — | — | — |
| Prison Cells 2 | — | 21 9 | 17 4 | 5 11<br>9 0 | — | — | — | — | — |

*Overcrowding.*—So far as cubic space is concerned there is not so much overcrowding, as in other barracks; but the surface area per bed is too small, on account of the height of the casemates. The whole work constitutes in reality one barrack room, intersected by division walls, and on two levels; and the cubic space and surface area may be considered as common. It would be very advisable to reduce the number of beds by about one fourth. Were this done the accommodation would be as follows:—

| Rooms. | Total Number of Men. | Proposed Number of Men. | Deficiency of Accommodation in Men. |
|---|---|---|---|
| No. | | | |
| 1, 2, 3 | 76 | 58 | 18 |
| 4 | 23 | 19 | 4 |
| 14, 15 | 32 | 22 | 10 |
| 16 | 7 | 7 | — |
| 17 | 11 | 8 | 3 |
| Total - - | 149 | 114 | 35 |

*Ventilation.*—The window and door space are very limited, and the former might be very advantageously augmented by additional openings; indeed some parts of the accommodation are almost dark. There are shafts in the roof of each arch for ventilation, but they are scarcely sufficient, and from their faulty construction they have to be closed in tempestuous weather. They should be increased in size or in number, and so constructed as to be capable of being permanently open. Inlets for fresh air should also be made in the opposite ends of each casemate close to the crown of the arch. In the small front rooms where the foul air of the lower rooms is unfortunately carried into the rooms above, separate outlet shafts and ventilation should be provided for each room. If these improvements are carried out, this barrack will be as healthy as its construction admits of. It is in fact a defensible work rather than a barrack, and is not suited for permanent occupation in such a climate.

*Ablution and Bath Accommodation.*—There is no proper ablution room. The present accommodation, such as it is, is very bad. There are no baths.

*Cook-house.*—The cook-house is under the old officers' quarters. It contains six boilers of the old pattern, but no oven. It has ventilation at the back and over the door.

*Women's Wash-house.*—There is an open shed used for this purpose.

*Latrines.*—There are two latrines, one for men and one for women, in two of the cells already mentioned. The ashpit is between them, from which the refuse is removed by contract every other day. The latrines consist of deep porous stone troughs, which are flushed out into the creek. There is no ventilation except by the door, and the whole arrangements are defective and offensive. The urinal is under the same roof.

*Drainage.*—The bastion is drained, and the sewer is carried through the works to the creek. The surface drainage is said not to be sufficient.

*Water Supply.*—Water for all purposes is derived from a rain-water tank; but the amount is insufficient, and has to be supplemented by the commissariat water cart. We have been informed by Dr. Burrell that there used to be a second tank, supplied by surface drainage from a filthy ditch in which there was a pig stye; and that in 1851 he urged, without success, a water supply being laid on to the barrack from a public reservoir about 100 yards distant, on account of the deaths of 23 men by cholera in 13 days out of a single company which then occupied the place. The surviving men had to be withdrawn as a measure of safety.

*Cells.*—There are prison cells in the bastion in addition to those in the old officers' quarters. The separate cells are good. They have a good yard in front and a cook-house.

*Sanitary Improvements required.*—These barracks are in many points deficient, and are in other respects among the worst in the command. There are no officers' quarters, no school, no reading room, nor any day room for the men. All that can be done is to diminish the overcrowding; to improve the ventilation until it is sufficient by night and day; to build a proper ablution and bath room; to provide steel boilers and an oven; to reconstruct the latrines and urinals on the plan already recommended for other barracks; to abolish the ashpit and substitute an iron box; and to improve the drainage and water supply. But it would be much better to abandon the place altogether, at least as a barrack for permanent occupation.

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## 15.—Vittoriosa Gate Barrack.

This is an old bad barrack situated in a densely peopled and unhealthy position. It consists of two floors of casemated rooms on a slope, intended to accommodate 120 men. The rooms are in steps one above the other. There is only one entrance, and all the rooms communicate by stairs and doors through the walls. In its present state this barrack is quite unfit for occupation, and has been condemned. At the time of our inspection it was occupied by married people. There is a cook-house used as a women's wash-house; it is quite dark. The rooms require more ventilation and proper conveniences to render them in any way suitable for their present purpose.

### *Vittoriosa Main Guard.*

This is simply an archway through the works, with a door at each end and a window above the door. There is a stair in the floor apparently communicating with the ditch outside, which appears to be used as an ashpit or depository for filth. There are no cells, and no prisoners' room. This guard is indeed one of the most defective we have ever seen. It is quite unfit for its purpose, and requires reconstruction or removal to another locality. The whole neighbourhood has a ruinous aspect consequent on the explosion of a powder magazine in 1806, from which it appears never to have recovered. It requires sanitary improvement in drainage, paving, and cleansing, in the same manner as Valetta has been dealt with. We are desirous of specially calling the attention of the authorities, both civil and military, to the subject, as the neighbourhood is one of the very worst in the garrison.

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## 16.—Couvre Porte Barrack, Vittoriosa.

This is a small casemated barrack for 62 non-commissioned officers and men (but it has had as many as 95 men in it), constructed in a ravelin outside Vittoriosa gate. The rooms are in two floors, and are in two sets at right angles to each other, following the outline of the work.

The following table gives the accommodation:—

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 6 | 25 3 | 12 5 | 13 8 | 635 | 52 | 1 | 3 6 | 3 11 |
| 2 | 6 | 25 3 | 11 9 | 13 8 | 600 | 50 | 1 | 3 6 | 3 11 |
| 3 | 6 | 25 5 | 12 0 | 13 8 | 600 | 51 | 1 | 3 6 | 3 11 |
| 4 | 4 | 17 0 | 13 9 | 12 8 | 714 | 58 | 1 | 3 6 | 3 11 |
| 5 | 11 | 35 2 | 13 5 | 6 3<br>5 3 | 644 | 42 | 1<br>1<br>1 | 4 7<br>6 10<br>3 1 | 1 5<br>4 4<br>5 3 |
| 6 | 4 | 20 11 | 12 2 | 3 0<br>6 6 | 589 | 63 | 1 | 3 6 | 3 11 |
| 7 | 4 | 20 11 | 12 2 | 3 0<br>6 6 | 589 | 63 | 1 | 3 6 | 3 11 |
| 8 | 4 | 20 11 | 12 2 | 3 0<br>6 6 | 589 | 63 | 1 | 3 6 | 3 11 |
| 9 | 9 | 16 11<br>24 0<br>15 0 | 14 2<br>13 9<br>4 2 | 12 8<br>12 8<br>6 5 | 659 | 66 | 1 | 3 8 | 4 2 |
| 10 | 8 | 13 0<br>16 11<br>16 10<br>16 10 | 8 5<br>13 9<br>13 9<br>13 9 | 5 8<br>6 5<br>5 8<br>6 5<br>5 8<br>6 5<br>5 8<br>6 5 | 591 | 90 | 1<br>1 | 6 10<br>3 9 | 4 4<br>4 11 |
| Guard Room - | Nil. | — | — | — | — | — | — | — | — |
| Prison Cells - | Nil. | — | — | — | — | — | — | — | — |

The high walls of Vittoriosa rise close to the barrack, and tend to stagnate the air. The rooms themselves open to the outer air only at one end. At the opposite end they are built against the work, and the lower rooms are partially cut out of the rock. The construction is not a good one for health.

*Overcrowding.*—This barrack gives more superficial area per man than most others, but the cubic space in some of the rooms is too small. It would be better to remove one man out of each room.

*Ventilation.*—The rooms have a fan-light over the doors, which can be taken out, but not opened in the usual sense, as it has no hinges. All the rooms except one have a shaft carried up to the parapet from the end of the room opposite the door, but there are no inlets for fresh air. The shafts are besides too small, and their area is still further contracted by thick iron gratings over the openings in the parapet.

To improve the ventilation it will be necessary to hinge the frames of the fan-lights, so that they can be pulled partially open.

The foul-air shafts should be enlarged, and gratings or louvres with more open area placed over them above. Each room should also have a properly louvred inlet introduced close to the roof above the fan-light.

*Ablution and Bath Accommodation.*—This consists of a dark room. Water has to be carried from a well. There is no bath. There should be a pump to throw water from the well to a cistern, whence it should be laid on to the ablution table and to a bath.

*Cook-house.*—The cook-house has boilers of the usual pattern, but no oven. Water is not laid on. Steel boilers and oven should be provided.

*Wash-house.*—There are no means of washing or drying linen. When married quarters are built wash-houses should be provided near them.

*Latrines and Urinals.*—The latrine is situated within Vittoriosa Gate, and is common to both barracks. It is of the usual construction, and is flushed into a cesspit in the adjacent ditch, which is emptied occasionally by contract, a process which gives rise to great nuisance as well as danger to health. The cesspit should be abolished, and the latrines properly drained to the sea; but if this is impracticable a Macfarlane's latrine to be flushed into a cart daily for removing the soil should be adopted.

*Ashpit.*—There is an ashpit for collecting the refuse. It was very offensive, and quite unnecessary. In such a situation the whole refuse should be collected and removed daily in an iron box, and the ashpit abolished.

*Chapel School, St. Margarita Hill, Cospicua.*

This is a very good, recently erected chapel school. It is spacious, light, and cheerful, and affords a gratifying contrast to the older military buildings of the garrison.

The only point requiring notice, is that the means of ventilation which have been provided are not quite sufficient. There is a wooden ceiling through which a number of openings have been made into the space under the roof, but there are no means of egress for the hot foul air, except an opening in the gable at each end. To supply the defect it will be necessary to place two louvred turrets of sufficient size on the ridge of the roof.

There are no inlets for fresh air, and the upper portions of the windows do not open. A number of inlets, with louvred ventilators, should be made close to the ceiling on opposite sides of the apartment, and the upper parts of all the windows should be hinged and supplied with ready means of opening and shutting.

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## 17.—Polverista Gate, Cospicua.

The barracks for the defence of this gate are situated along the top of an immense curtain connecting two bastions, and stretching across a deep ravine. They consist of a series of casemates in the thickness of the wall, entered from an open terrace 164 yards in length, and a yard and a half wide. The gate passes through the centre of the curtain, at the bottom of the ravine, many yards below the barracks.

The site is a lofty one, and commands extensive views, but the ground about the place is barren and very dusty. It becomes very hot during summer, and, as there is much wind at times, the atmosphere becomes filled with hot, dry dust; and the troops who have occupied the barracks are stated to have suffered considerably from ophthalmia.

There are 18 casemates used as barrack rooms. They are all alike in construction. Each room is 33 feet long, 18 feet 6 inches broad, 9 feet 8 inches to the spring of the arch, which is semicircular, with a rise of 9 feet making the total height of the room 18 feet 8 inches. Each casemate has a door opening in the centre of one end, and two windows over the door 4 feet 8 inches by 3 feet 1 inch. There are no windows at the end opposite the door, and the beds at the end are 30 feet from the nearest inlet for fresh air.

*Overcrowding.*—The regulation number of men is 14 per room, and each man has 581 cubic feet of space and 44 superficial feet. The rooms are hence overcrowded. At the very most they should not be allotted for more than 12 men per room.

*Ventilation.*—Except the doors and windows, the only means of ventilation provided are small shafts at the far end, which are carried up into the parapet above. They are not sufficient to keep the air pure; they should be enlarged, and a properly louvred inlet should at the same time be provided close to the crown of the arch over the door.

*Ablution and Bathing Accommodation.*—The barrack having only recently been completed, the ablution arrangements were of a very temporary character. A casemate in the centre of the line of barrack rooms was about to be fitted up for a lavatory. There is no water supply nearer than a well at the bottom of the ravine, and water has to be carried up to the level of the ablution room; the foul water being thrown into tubs and carried away. The whole arrangement is most inconvenient, and requires entire remodelling. Water should be laid on to a cistern for the ablution room, and the waste water drained into the same collecting tank as the latrine drainage is led to.

*Water Supply.*—The only source of water is the well alluded to, and another at a short distance; but a branch aqueduct passes the works sufficiently near and at such an elevation as to allow water to be properly laid on to the barrack. This great improvement should be carried out forthwith. If for any reason it be impossible to do so, the water supply for the barrack should be raised from the well by a force pump.

*Cook-house.*—There was no proper cook-house at the time of our inspection. A casemate had been temporarily occupied for the purpose, but it had no proper fittings, and no chimney, and the smoke was an intolerable nuisance and discomfort. All the water had to be carried. A suitable cook-house, with steel boilers and oven, and water laid on with drainage, should be provided as near as possible to the barracks. If no more convenient site is available, we would recommend the cook-house we saw to be properly fitted up and rendered suitable for its object.

There is no accommodation for washing linen.

*Latrines and Urinals.*—These conveniences are situated at one end of the line of barrack rooms. They are of the usual construction, and are washed out with water, which has all to be carried up by hand. They are drained through the works into a large cesspit outside the gate in the ditch. Although at a considerable distance from the barracks, there is great nuisance experienced when this cesspit is emptied. There appears to be no outlet for this drainage at present, and all that can be done is to reduce the nuisance as much as possible by ventilating the cesspit by a shaft carried up from it to a height of several feet above the top of the parapet, and by using a sewage pump for raising its contents into a proper closed cart for removal. Or a raised iron or stone sewage tank to receive the flushing of the latrines and other waste water might be placed in an angle of the curtain, at such an elevation as to admit of its being discharged into a properly constructed close cart. The tank would require ventilation by a shaft carried above the parapet. It should be large enough to hold four days' consumption of water. The tank should be emptied into the cart daily if possible. The present cesspit should then be filled up.

*Married Quarters.*—The married quarters belonging to this and other barracks are in a range of fortini in an adjoining curtain. Each quarter should consist of two fortini, with a door between them through the pier, and all upper floors should be removed.

The canteen is also in them. It is very imperfect, and requires re-arrangement.

*Officers' Quarters.*—One casemate is used as an officers' quarter, but there is no servants' room, and it is hence deficient. It would be better to have the officers' quarters at Zabbar gate, which is at no great distance, and to add the present quarter to the men's accommodation.

*Sanitary Improvements required.*—These are sufficiently indicated above, and should be carried out while the barrack accommodation is being completed.

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## 18.—Zabbar Gate Barrack.

This is a small barrack for troops defending the gate. It consists of two sets of casemates, one on either side the gateway, with the road passing between them. There is an upper floor over the gateway containing officers' quarters. The situation is lofty and airy, but the construction of the barracks is not good, and they are stated to be occasionally unhealthy. They were built in the time of the Cotoneras, and, however well adapted they may be for defensive purposes, they are not very suitable for constant occupation by troops.

The following table gives the accommodation:—

| Rooms. | Number of Men. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| Nos. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1, 2, and 5, each | 11 | 34 5 | 13 9 | 7 1<br>14 0 | 640 | 44 | 1 | 3 6 | 3 6 |
| 3 and 4, each - | 22 | 38 10<br>33 2 | 11 1<br>18 5 | 3 9<br>16 0 | 626 | 51 | 1<br>1 | 4 3<br>3 6 | 4 7<br>3 6 |
| 6 | 12 | 29 7 | 18 10 | 7 11<br>12 6 | 647 | 44 | 1 | 3 6 | 2 6 |
| Officers' Guard Room - | 12 | 30 0 | 15 6 | 3 9<br>15 1 | 630 | 39 | 1 | 6 10 | 5 2 |
| Guard Room - | 1 | 31 10 | 11 2 | 3 9<br>16 1 | — | — | — | — | — |

These seven rooms have regulation accommodation for 183 men, although only occupied by 101 men. Notwithstanding the size of the rooms, their floors are rather crowded with bedsteads, on account of the height of the arches, by which the cubic space is to a great extent at a useless height above the floors. They are certainly not adapted for 183 men, and ought to contain no more than 120 at all ordinary times.

*Ventilation.*—The chief source of the light and ventilation is from embrasures or small windows, the frames of which can be taken out, but do not admit of being opened. There are also openings two feet square in the crowns of the arches, with a short ventilating shaft rising above the roof outside. These shafts are not properly constructed, and are fitted with wooden covers to keep out the rain. As these covers close the shafts entirely, the ventilation is completely stopped every rainy day. In their present state the rooms are dark and badly ventilated; but these defects admit of remedy by intro-

ducing more windows, or enlarging existing windows, wherever it can be done with safety. Permanent inlets for fresh air, properly louvred, should also be introduced at the top of the walls under the arches, and the shafts in the roof should have louvred turrets to keep out the rain, and at the same time to admit of their being constantly open.

*Lavatory and Bath Accommodation.*—This consists of a small shed, without any means either of washing or bathing. A room of proper dimensions, and suitably fitted up, should be provided.

*Cook-house.*—This is an underground bombproof below one of the barrack rooms. It has four boilers, but no other means of cooking. Water has to be carried from a tank, and there are no means of drainage. All refuse water has to be carried out by hand, and is emptied on the neighbouring glacis of St. Clement. The improved steel boilers and oven should be introduced.

*Wash-house.*—There is no women's wash-house.

*Latrines.*—The latrines for non-commissioned officers and men, and also for women, are in the same building, and are entered by different doors. They are not drained, but are connected with a cesspit, which is said to be emptied by the contractor once in three months, the operation lasting three days. The cesspit is only 20 yards from the men's quarters. The latrines require additional ventilation. They require reconstruction, with Macfarlane's apparatus, to be flushed out daily into a cart.

*Drainage.*—There is no drainage. The surface water flows into a neighbouring field. The cook-house water, as already stated, is thrown on the glacis, and other slops are thrown into the ashpit. These defects should be remedied in connexion with any drainage works carried out in the district. If no outlet can be obtained, the waste water from the ablution room and cook-house should be conducted to a distance sufficient to prevent injury, and allowed to run away on the surface; or the whole sewage might be collected and removed in the way recommended above for Polverista Barrack.

*The Water Supply* is derived from a rain-water tank, which appears to receive a considerable amount of surface drainage and impurities. At the time we examined the water it was very muddy, and unfit for use. A better supply is absolutely necessary. It should be brought from the aqueduct to cisterns for the ablution room, cook-house, and latrines.

*Married Quarters.*—These are in the adjacent fortini. As already stated, there is no wash-house for linen, and the women cook in the open air in small fire-clay stoves, which answer every purpose. These fortini should be dealt with as already described.

By far the best part of the barrack are the officers' quarters, which are high, well ventilated, and overlook the surrounding country; but as a whole this barrack is a very inferior one, although it has the advantage of an open, healthy position. We have suggested above all the sanitary improvements of which it is capable, but it will never be fit for occupation by more men than are simply required for guard duty.

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## 19.—St. Clement's Bastion.

This is a new barrack for 56 men, situated in the Cotonera lines, and in the great Verdala intrenchment. The men's rooms are in a ravelin, consisting of a series of casemates connected together through the middle, and having only one door of entrance.

The officers' quarters are in the intrenchment.

The barrack was occupied for the first time in January 1861.

The accommodation is as follows:—

| Rooms. | Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Loopholes. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| Nos. | | Ft. | Ft. | Ft. | | | | Ft. in. | In. |
| 1, 2, 3, 4 | 12 | 40 | 14 | 14 | 653 | 46 | 12 | 1 3 | 3 |
| 5 | 8 | 40 | 11 | 14 | 770 | 55 | 20 | 1 3 | 3 |

*Overcrowding.*—The superficial area per man is about a third less than is required for health. The first four rooms in the table should accommodate at all ordinary times no more than 8 men per room; and the room No. 5 would be better with 7 than with 8 men.

*Ventilation.*—The only means of light to these casemates is by double tiers of loopholes, the lower tiers only of which have windows capable of opening to admit air. Shafts have also been carried up through the roofs. The light and ventilation are very deficient,

and require improvement. Permanent inlets should be provided at the top of the outer walls, and the loopholes should be enlarged into small windows, all of which should be capable of being opened.

These windows might be supplied with loopholed wrought iron shutters, which would be quite as effectual against shot as the soft Maltese stone, and capable of being used in the event of its being necessary to do so. This plan has, we believe, been already proposed, and it is the only one by which the rooms can be preserved in a wholesome condition.

Although the barrack was occupied at the time of our inspection some parts of it were unfinished. This was the case with the ablution room and cook-house. This cook-house should have steel boilers and oven. The surface drainage was also imperfect.

*The Latrine* is a cave cut out of the rock, and is of the usual construction. The trough is of porous stone, and too deep. The urinal is also of porous stone. Macfarlane's latrines and a slate urinal should be substituted, and if no drainage has been provided the arrangement already described should be adopted.

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## 20.—Fort Manoel.

This fort is situated on an island in the Quarantine harbour, close to the Lazaretto, and at a sufficient height above the sea level to ensure a good fall for drainage. The position is exposed to the sea breeze, and is healthy. The area within the fort, exclusive of the ditch, is 22,500 square yards. The subsoil is the ordinary sandstone rock of the neighbourhood.

The fort is a square with salients. Across the higher end of the square are two blocks of building in line containing officers' quarters, and the chapel now used as a school. At right angles to these are two detached blocks bounding other two sides of the parade ground, containing men's rooms, quarters, offices, &c. Behind the line of officers' quarters, and separated from it by a narrow lane, is a row of casemates constructed against the works, the wall of which, partly of rock, forms the end wall of the casemates to a third of their height. Over the casemates are other works rising above the outer line. These casemates are thus embedded, as it were, in the defences, and they project into the salients. They are occupied as soldiers' quarters, stores, cook-house, &c. The floors are of course below the level of the works behind; from the slope of the ground they are also partly below the level of the surface outside.

The floors of casemates Nos. 1 to 12 are of soft sandstone. The others are hard stone. The flooring in the largest casemate is in a bad state of repair.

The rooms have windows in the built part of the end wall, but at some height above the floor. The casemates in the salients are irregular in form, and have windows on three sides. They are by far the best ventilated, but the general aspect of the whole of them is dullness and deficiency of light, defects which cannot be removed.

The men's rooms in the detached blocks are much better, although admitting of improvement. They are in two floors; each pair of rooms above and below forms a barrack house, and there is an inside stair passing from the room below to the room above, occupying space, interfering with the ventilation, and allowing the foul air from the room below to pass into the room above. All these rooms should at once have the stairs removed, and access to the upper floor should be provided by a verandah with stairs at the ends.

The following table gives the details of the barrack accommodation:—

Date of Construction, time of the Knights.
Total Number of Rooms, 24.
Total Regulation Number of Men, 317.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 66 | 95 0<br>38 9<br>38 9<br>22 0 | 17 4<br>13 10<br>13 10<br>13 10 | 6 5<br>8 0 | 545⅝ | 40¼ | 1<br>6 | 4 5<br>5 4 | 4 5<br>4 5 |
| 2 | 11 | 32 7 | 15 9 | 6 9<br>9 0 | 656½ | 46½ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |
| 3 | 11 | 32 7 | 15 9 | 6 9<br>9 0 | 656½ | 46½ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 4 | 11 | 32 7 | 15 9 | 6 9<br>9 0 | 656½ | 46½ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |
| 5 | 11 | 32 7 | 15 9 | 6 0<br>9 0 | 656½ | 46½ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |
| 6 | 9 | 33 0 | 16 0 | 7 0<br>9 0 | 837 | 58⅔ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |
| 7 | 9 | 33 0 | 16 0 | 7 0<br>9 0 | 837 | 58⅔ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |
| 8 | 9 | 33 0 | 16 0 | 7 0<br>9 0 | 837 | 58⅔ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |
| 9 | 9 | 33 0 | 16 0 | 7 0<br>9 0 | 837 | 58⅔ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |
| 10 | 9 | 33 0 | 16 0 | 7 0<br>9 0 | 837 | 58⅔ | 1<br>1 | 5 0<br>4 5 | 4 10<br>4 5 |
| 11 | 9 | 33 0 | 16 0 | 7 0<br>9 0 | 837 | 58⅔ | 1<br>1 | 5 4<br>4 5 | 4 10<br>4 5 |
| 12 | 30 | 96 0<br>39 0 | 15 10<br>13 9 | 7 0<br>9 0 | 982⅔ | 68½ | 5<br>1<br>1 | 5 4<br>7 0<br>5 0 | 4 10<br>3 0<br>3 0 |
| 13 | 12 | 13 10<br>15 9<br>30 8 | 9 9<br>14 0<br>13 9 | 10 6<br>6 6<br>3 0 | 588 | 65½ | 1<br>1 | 2 6<br>2 0 | 3 6<br>3 6 |
| 14 | 11 | 14 0<br>13 9<br>30 8 | 13 10<br>13 9<br>13 9 | 10 6<br>6 6<br>3 0 | 662 | 72 | 1<br>1<br>1<br>1 | 7 0<br>5 0<br>2 6<br>2 0 | 3 0<br>3 0<br>3 6<br>3 6 |
| 15 | 10 | 14 0<br>13 9<br>30 8 | 13 10<br>13 9<br>13 9 | 10 6<br>6 6<br>3 0 | 728 | 79⅓ | 1<br>1<br>1<br>1 | 7 0<br>5 0<br>2 6<br>2 0 | 3 0<br>3 0<br>3 6<br>3 6 |
| 16 | 10 | 14 0<br>13 9<br>30 8 | 13 10<br>13 9<br>13 9 | 10 6<br>6 6<br>3 0 | 728 | 79⅓ | 1<br>1<br>1<br>1 | 7 0<br>5 0<br>2 6<br>2 0 | 3 0<br>3 0<br>3 6<br>3 6 |
| 17 | 10 | 14 0<br>13 9<br>30 8 | 13 10<br>13 9<br>13 9 | 10 6<br>6 6<br>3 0 | 728 | 79⅓ | 1<br>1<br>1<br>1 | 7 0<br>5 0<br>2 6<br>2 0 | 3 0<br>3 0<br>3 6<br>3 6 |
| 18 | 10 | 14 0<br>15 8<br>30 8 | 9 6<br>13 9<br>13 9 | 10 6<br>6 6<br>3 0 | 704¾ | 79⅓ | 1<br>1 | 1 10<br>2 6 | 2 6<br>3 6 |
| 19 | Canteen - - | 14 0<br>15 8<br>30 8 | 9 6<br>13 9<br>13 9 | 10 6<br>6 6<br>3 0 | — | — | 1<br>1 | 1 6<br>1 10 | 3 6<br>2 6 |
| 20 | 2 | 13 10<br>15 8<br>30 8 | 10 3<br>13 10<br>13 9 | 11 0<br>6 6<br>3 0 | 1,746 | 390 | 1<br>1<br>1<br>1 | 5 6<br>7 0<br>2 0<br>3 0 | 3 0<br>3 0<br>3 9<br>3 6 |
| 21 | 15 | 14 3<br>14 0<br>30 8 | 13 10<br>13 0<br>13 9 | 10 0<br>6 6<br>3 0 | 252⅔ | 53⅓ | 1<br>1<br>1<br>1 | 5 6<br>7 0<br>2 0<br>3 0 | 3 0<br>3 0<br>3 9<br>3 6 |
| 22 | 15 | 14 3<br>14 0<br>30 8 | 13 10<br>13 0<br>13 9 | 10 0<br>6 6<br>4 0 | 252⅔ | 53⅓ | 1<br>1<br>1<br>1 | 5 6<br>7 0<br>2 0<br>3 0 | 3 0<br>3 0<br>3 9<br>3 6 |
| 23 | 15 | 14 3<br>14 0<br>30 8 | 13 10<br>13 0<br>13 9 | 10 0<br>6 6<br>4 0 | 252⅔ | 53⅓ | 1<br>1<br>1<br>1 | 5 6<br>7 0<br>3 0<br>3 0 | 3 0<br>3 0<br>3 9<br>3 6 |
| 24 | 15 | 14 3<br>14 0<br>30 8 | 13 10<br>13 0<br>13 9 | 10 0<br>6 6<br>4 0 | 252⅔ | 53⅓ | 1<br>1<br>1<br>1 | 5 6<br>7 0<br>2 0<br>3 0 | 3 0<br>3 0<br>3 9<br>3 6 |
| Guard Room - | 2 Guard Rooms; 1 for 1 Officer, 1 for 18 Men - | 24 0 | 17 0 | 8 11<br>9 6 | 367 | 22⅔ | each<br>1<br>2 | 5 4<br>1 10 | 4 10<br>1 5 |
| Prison Cells 2 each | — | 8 0 | 7 0 | 9 10 | 550 | 56 | 6 | 1 10 | 2 5 |
| Prison Cells 6 each | — | 11 0 | 6 0 | 11 6 | 759 | 66 | | | |

*Overcrowding.*—It will be observed that the amount of space per man varies in some rooms to the extent of two or three times what it is in others, and that with a few exceptional cases the superficial area is much smaller than ought to be allowed in such a climate.

No. 1 casemate should contain no more than 50 men, instead of 66. Nos. 2, 3, 4, and 5 should have 10 men per room instead of 11. Nos. 13 and 14 should have 10 men each, and Nos. 21, 22, 23, and 24 should have 6 men each instead of 15. These reductions would give 258 men, instead of 317, as the strength for which there should be accommodation in the fort.

*Ventilation.*—There are no means of ventilation except by doors and windows; and as many windows have no glass, but only wooden shutters, which must be closed in rainy or wet weather, the rooms are not only left without ventilation, but almost without light, whenever this is done. All the barrack rooms, therefore, require ventilation by shafts carried up from the ceiling to above the roof, and terminating in louvred turrets, and by louvred inlets in the outer walls near the ceiling, wherever they can be most advantageously placed to catch external currents of air (*See* Plans X. and XI., and Fig. 19). All the windows should also have glazed sashes.

*Ablution and Bath Accommodation.*—None. This accommodation it was stated was in course of being supplied.

*Cook-house.*—There is one cook-house, under the cavalier. It is in reality a branch of the large casemate No. 1, divided off by a wall. An opening is left under the wall to assist in ventilating the cook-house. The floor is 5½ feet below the level of the ground outside. It contains 8 iron boilers, and no oven. Partly from position, and partly from not being exposed to air currents, this cook-house is intolerably hot. A large double wooden shaft has been carried from its roof above the top of the works, but it is quite insufficient to keep down the temperature. Without mechanical means of renewing the air it will never be possible to keep the place cool; but it would be much better to provide a proper cook-house than to incur such an expenditure. There are no means of draining away the refuse water at present, and there is no water laid on. All the water required for cooking has to be carried from pumps in the barrack square, down the stairs to the cook-house, and the refuse water has to be carried up again, and then to a drain. It is stated that a drain could be easily constructed. We recommend the erection of a detached cook-house on Plan XIX., in some convenient locality, and that it be fitted up with steel boilers and oven. It should be light and airy. Water should be laid on from a cistern. There should be a drained sink, a place for coals, an iron box for refuse, and a broad table for giving out the dinners.

*Wash-house.*—There is no place for washing the barrack linen within the fort, nor are there any married quarters, properly so called.

*Latrines and Urinals.*—These are of the usual construction, and are drained to an outlet in the harbour 150 yards away. They require the usual reconstruction.

*Drainage.*—The only surface drainage is that afforded by the slope of the ground. The drainage generally is said to be sufficient, except that of the cook-house already mentioned.

*Guard Room and Cells.*—At the entrance to the fort is the guard room, with cells attached to it, and a little higher up are the provost cells.

All the cells require more ventilation. The provost cells should have either an opening over the door or a shaft in the roof. The privy belonging to these cells requires ventilation.

A large disused magazine in one of the salients was being converted into a reading and day room, for which it would afford ample accommodation.

*The Sanitary Improvements required* for this barrack are sufficiently indicated above.

### *Lazzaretto Barracks.*

This establishment belongs to the civil government, by whom it has been lent temporarily for the purpose of increasing the barrack accommodation at Fort Manoel; but it may be reclaimed at any moment for its original purpose. The buildings are of considerable extent, and are situated along the sea shore under the fort. They are arranged in a series of squares, containing magazines for goods, and quarters for persons undergoing quarantine. At a short distance is the Plague hospital, at present occupied as soldiers' rooms and married quarters.

The Lazzaretto proper is a complicated series of buildings, apparently constructed at different times, and without any regard to sanitary considerations. It contains many apartments of various dimensions; some of them very large, dark, and without ventilation, others smaller and with more light and air. The courts are all closed, and surrounded by the high walls of the buildings, which stagnate the air from which most of the ventilation, such as it is, is derived. Taken as a whole, although better than some other quarantine establishments in the Mediterranean, this lazzaretto is not a fit place for habitation, and it has been planned apparently more under the influence of fear than of an enlightened consideration for health.

*The Plague hospital* is a very singular specimen of hospital architecture. It consists of three double rows of cells about 12 feet by 9 feet, built back to back. The cells are on the ground, and the rows are separated by narrow alleys from each other. The whole hospital is surrounded by walls higher than itself, and is about the last place where a case of severe febrile disease might be expected to progress favourably. The only part of the establishment at all fit for sick is the medical officer's quarters, which face the sea, and cut off the ventilation on that side.

There were about 200 men in the quarantine establishment at the time of our inspection, most of them in casemated rooms, apparently constructed for merchandize.

A privy at the end of one of the corridors is discharged through a cleft in the rock, from which the ventilation of some of the rooms is obtained.

The whole accommodation is of a very imperfect character, and may be taken as indicating a want of barrack room, rather than as supplying a want.

As the present occupation is only temporary, we have no recommendation to make as to its improvement, except that wherever additional ventilation can be given to the rooms by louvres in the wooden shutters or windows, it should be done.

It is to be hoped that advancing intelligence, and real sanitary improvement, such as is now progressing in Malta, may lead to the abolition of this lazzaretto at no distant period, and to its vast store rooms being turned to some useful commercial purpose.

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## 21.—Fort Tignè.

This fort is situated on a point of land on the west side of the mouth of the Quarantine harbour. The situation is completely isolated, almost surrounded by the sea, at a sufficient elevation to ensure thorough drainage; and it ought to be healthy.

The fort is a quadrangular lozenge-shaped structure, the sides of which are composed of casemates surmounted by batteries, enclosing a large court-yard or parade ground. At one of the points is a round tower, through which access is obtained to the interior, and from the tower a caponière is carried across the court diagonally to the opposite angle, dividing the ground into two equal triangular portions.

The total area within the counterscarp is 11,520 square yards. The subsoil is rock of the ordinary porous formation. The level of the court is considerably below the level of the ground outside, which forms the glacis of the fort; the round tower being the only part visible from a distance. All the buildings are constructed of soft Maltese stone, and have stone floors.

The men's rooms are in the casemates, on two sides of the fort, in the tower, and in the caponière. The other casemates are occupied as officers' quarters, stores, cook-houses, canteen, &c.

The casemates in the sides have each a separate door and two loopholes on each side of it, with a window over, together with loopholes at the further end. The rooms in the caponière have loopholes on opposite sides. The large room in the tower has loopholes at short distances all round.

The rooms are generally deficient in light, and as the windows are only provided with boarded shutters, the rooms are dark whenever high wind or rain necessitates the openings being closed. There is one large room for 20 men in the angle of the works opposite the tower, which has no windows at all: light is only obtained from small openings in the roof. The whole accommodation is only such as should be used simply for a guard or during the emergency of a siege.

The following table gives the details of the accommodation:—

Date of Construction, time of the Knights.
Total Number of Rooms, 17.
Total Regulation Number of Men, 106.

| Barrack Rooms. | Regulation Number of Men in each Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Area in Ft. per Man of Floor Space. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | School | 20 5 | 16 2 | 8 0<br>4 10 | — | — | 8 | 2 2 | 1 0* |
| 2 | 14 | 44 0 | 16 0 | 8 0<br>4 10 | 560 | 50 | 18 | 2 2 | 1 0* |
| 3 | 1 | 20 2 | 15 0 | 8 0<br>4 10 | 3,377 | 302 | 4<br>4 | 2 2<br>1 3 | 1 0*<br>1 3 |
| 4 | Cook-house | 23 2 | 17 0 | 8 0<br>3 0 | — | — | 1<br>1 | 5 0<br>3 9 | 3 0<br>3 6 |
| 5 | 7 | 24 3 | 16 9 | 8 0<br>3 0 | 527 | 47¾ | 7<br>1 | 2 2<br>3 9 | 1 0*<br>3 0 |
| 6 | 7 | 24 3 | 16 9 | 8 0<br>3 0 | 527 | 47¾ | 7<br>1 | 2 2<br>3 9 | 1 0*<br>3 0 |
| 7 | 7 | 24 3 | 16 9 | 8 0<br>3 0 | 527 | 47¾ | 6<br>1 | 2 2<br>3 9 | 1 0*<br>3 0 |
| 8 | Officers' Kitchen | 24 3 | 16 9 | 8 0<br>3 0 | — | — | 6<br>1 | 2 2<br>1 6 | 1 0*<br>4 6 |
| 10 | 1 | 22 0 | 13 3 | 8 0<br>4 0 | 3,080 | 291 | 5 | 2 2 | 1 0* |
| 11 | 8 | 22 0 | 13 3 | 9 0<br>3 0 | 440 | 36⅜ | 5<br>1 | 2 2<br>4 9 | 1 0*<br>3 9 |
| 12 | 8 | 22 0 | 13 3 | 9 0<br>3 0 | 440 | 36⅜ | 5<br>1 | 2 2<br>4 9 | 1 0*<br>3 9 |
| 13 | 8 | 22 0 | 13 3 | 9 0<br>3 0 | 440 | 36⅜ | 5<br>1 | 2 2<br>3 5 | 1 0*<br>3 10 |
| 14 | 8 | 22 0 | 13 3 | 9 0<br>3 0 | 440 | 36⅜ | 3 | 2 2 | 1 0* |
| 15 | 20 | 37 0<br>20 6 | 25 0<br>15 9 | 9 0<br>3 0<br>8 4<br>3 0 | 598 | 62⅖ | 7<br>1 | 2 2<br>5 0 | 1 0*<br>3 8 |
| 16 | Canteen | 21 0 | 16 0 | 8 3<br>4 4 | — | — | 9 | 2 2 | 1 0* |
| 17 | 19 | 49 9 | 19 0 | 9 6 | 421 | 49¾ | 1 | 4 9 | 3 9 |
| Guard Room | 7 | 19 6 | 9 2 | 10 5 | 266 | 25½ | 3 | 2 2 | 1 0 |
| Prison Cells 1 | | 19 6 | 7 2 | 10 5 | 1,455 | 139 | 3 | 2 2 | 1 0 |

* Loopholes.

*Overcrowding.*—Both the cubic space and superficial area per man are less than they ought to be; and the numbers of men per room should be reduced in the following proportions:—

Room No. 2 should have 13 men instead of 14; rooms 5, 6, and 7 should have 6 men each instead of 7; Nos. 11 to 14 should have 5 men each instead of 8; No. 15 is scarcely fit for occupation, and should not have above 15 men instead of 20; No. 17 should have 13 men instead of 19, its present allotment. The *men's* rooms would hence accommodate 79 men, instead of 106.

The only safe way of dealing with a work such as this, which has not been constructed on any defined sanitary principle, is to consider it simply as a defensible work, rather than as affording barrack accommodation, and to keep no more than a guard in it in time of peace.

*Ventilation.*—The ventilation is very deficient, partly on account of the casemates being sunk below the level of the ground, partly because the subject has not been attended to in their construction. In five of the rooms there are openings in the substance of the arch, carried laterally to the outside, most of which were stuffed up at the time we saw them. The other rooms had no independent means of ventilation. So long as the shutters are left open the rooms are ventilated, but when they are closed for any reason there is no ventilation, and the air becomes very impure. Proper inlets through the walls, and shafts, carried up through the roofs, as in Plan XI., are required in this as in other cases, if this fort is to be occupied as a barrack.

*Warming and Lighting.*—There are no fireplaces. The rooms are lighted by oil lamps, the oil ration for which lasts about three days. Candles are then used for the rest of the week.

*Ablution and Bath Accommodation.*—There is none of either class of accommodation. The men generally wash themselves at the pump. There is sufficient space for every needful convenience, and a proper ablution and bath room should be constructed on Plan XVII.

*Cook-house.*—There is one cook-house in a casemate. It has four boilers and a stone oven. Being situated in a corner it is very hot, and requires all the ventilation which can be obtained for it. The new steel boilers and oven, Plan XVIII., should be provided. Water is carried from the pump, and the refuse water is removed and thrown into the sea. A drain should be provided.

*Wash-houses.*—None. The washing is done in an old counterscarp gallery, and the linen is dried on lines across the ditch. It is hardly necessary to make any further provision of this nature unless the fort were to be converted into married quarters.

*Latrines.*—These are situated in an old musketry gallery. They are of the usual Maltese construction, and are cleansed by throwing down water every morning. The place is neither ventilated nor lighted. The latrines require entire reconstruction.

*Drainage.*—There is one drain from the latrines to the sea, with which other cross drains from the officers' water-closets, urinals, &c. are connected. The outlet is into a shallow bay close to the landing-place of the fort, and the effluvia arising from the sewage during the warm weather are said to be "horrible," and very injurious to the men. The latrine drainage should be carried into deep water at a distance from the shore by means of an iron pipe, and proper drains for surface and refuse water should be connected with it.

The drainage, such as it is, is confined to one angle of the fort, and there is no provision for carrying off the rain-fall from the parade ground, which lies on the surface until it sinks into the subsoil or evaporates. All refuse water has to be carried out by hand to the sea.

*Officers' Quarters.*—There are two quarters for officers in the fort, one of which is nearly dark.

*Married Soldiers' Quarters.*—There are none. Three of the soldiers' rooms and the officers' kitchen were inhabited by married men, and the remainder were in lodgings outside.

*The Sanitary Improvements required* are indicated above, viz., diminution of overcrowding, ventilation, better means of personal cleanliness, reconstruction of latrines, and of drainage, and more water. But it would be better to occupy the fort only as a place of guard or as married quarters.

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## 22.—Pembroke Barrack, St. George's Bay.

This is a new barrack intended for the accommodation of one commanding officer, 30 officers with 25 servants, 32 serjeants, and 980 rank and file engaged in rifle practice. It covers the crest of a rocky ridge on the west side of St. George's Bay, about three miles west of Valetta. The ground slopes rapidly towards the bay on the east, and also towards the sea on the north and north-west. The site is very favourable for receiving all wholesome breezes, and ought to be healthy. It has hitherto proved so, for up to the time we visited the barrack, it had furnished a very small per-centage, indeed, of sick to hospital; affording in this respect a striking contrast to the admissions from the barracks within the garrison.

Part of the ground was previously occupied by a camp, and many of the tents were pitched in a faulty position against the steep slopes below the ridge. It was found that these tents, although accommodating only six men each, were by no means so healthy as the new barracks.

The buildings are all on one floor. They consist of a series of arches of white sandstone, erected in blocks, in two long parallel lines, with a spacious parade ground between them. The officers' quarters are at a lower level, nearer the sea, and are constructed in a similar manner.

An arched stone verandah is carried along the east side of each line to afford shelter from the sun's rays. The rooms are all alike. They have two windows with a door between them at each end; and they are ventilated by shafts through the roof, and by inlets for fresh air.

Each room has a porch on the west side, covering the door, and entered from the side, and in the outer part of the porch is a small room containing a night urinal. All the floors are of stone, and raised above the ground, with a free circulation of air beneath.

Between every two pair of rooms are placed two serjeants' rooms, each having a door into the corresponding barrack room, but the door is never opened. These rooms are also ventilated through the roof. They have each a fireplace with the ordinary pattern barrack grate. There are no fireplaces in the men's rooms.

The accommodation is as follows:—The commanding officer has a sitting-room 19′ × 14′, and a bed-room 12′ × 13′; a small kitchen and servants' bed-room. There are three blocks of officers' quarters, each containing accommodation for 10 officers (one room 14′ × 12′ being allotted to each officer), and four servants' rooms intended for two servants per room.

The men's accommodation is placed in six blocks, of which the details are as follow:—

| Blocks. | Number of Rooms. | Number of Men per Room. | Dimensions of Rooms. | | | Cubic feet per Man. | Superficial feet per Man. |
|---|---|---|---|---|---|---|---|
| | | | Length. | Breadth. | Height. | | |
| | | | Ft. in. | Ft. | Ft. | | |
| A - - { | 6 | 1 Serjeant. | 14 9 | 10 | 14 | 2,065 | — |
| | 14 | 14 | 30 0 | 21 | 14 | 630 | 45 |
| B. - - { | 6 | 1 Serjeant. | 14 9 | 21 | 14 | 4,337 | — |
| | 14 | 14 | 30 0 | 21 | 14 | 630 | 45 |
| C. - - { | 4 | 1 Serjeant. | 14 9 | 10 | 14 | 2,065 | — |
| | 7 | 14 | 30 0 | 21 | 14 | 630 | 45 |
| D. - - { | 4 | 1 Serjeant. | 14 9 | 10 | 14 | 2,065 | — |
| | 7 | 14 | 30 0 | 21 | 14 | 630 | 45 |
| E. - - { | 6 | 1 Serjeant. | 14 9 | 21 | 14 | 4,337 | — |
| | 14 | 14 | 30 0 | 21 | 14 | 630 | 45 |
| F. - - { | 6 | 1 Serjeant. | 14 9 | 10 | 14 | 2,065 | — |
| | 14 | 14 | 30 0 | 21 | 14 | 630 | 45 |

It would have been better to have allowed a larger cubic space per man in these new barracks, or at all events to have increased the superficial area by making the rooms *wider* and lower in the roof, but the construction is so simple and the local position so fully exposed to every breath of wind, that the defect will probably be of little consequence. In any future barracks of the same construction, and in a similar position, it would be safer to allow about 700 cubic feet and 65 superficial feet per bed; and the chief structural defect of this barrack, arranging the beds with their heads along the dead walls instead of between the windows, should be avoided.

*Ventilation.*—It is probable that the present shafts and inlets will be sufficient in practice to keep the air pure at night; but if not the inlets should be enlarged until this condition is secured.

*Ablution and Bath Accommodation.*—There is an ablution room with stone benches and a bath, but water has to be carried from a distance. The room and fittings are of the usual porous stone, and are always wet or damp. Slate slabs with basins let in should be substituted.

*Latrines.*—The latrines are also of porous stone, and should be reconstructed with Macfarlane's troughs. They are drained into the bay; but the sewage should be carried by an iron pipe further into the water.

There is a large cook-house with combined boilers and ovens, but they did not act properly on account of a defect in the proportionate sizes of the flues. Steel boilers and ovens should be substituted.

There is a guard room which is ventilated, but not sufficiently so. The cell and lock-up attached to it are well ventilated.

The officers' quarters referred to above are too small, as they consist only of one room without thorough ventilation. Another room could easily be added by constructing an additional floor above. This should certainly be done.

Pembroke barracks could hardly be said to be complete when we saw them. They were deficient in serjeants' mess, reading room, canteen, barrack stores, shops, married quarters, and prison cells.

*The Sanitary Arrangements* admit of improvement in the following points of detail:—

The porous stone urinals in the porches will have to be replaced by slate or earthenware urinals supplied with water for cleansing. The night urinal recently constructed by Jennings should be tried here. The stone fittings of the ablution room should be replaced by slate slabs with sunk earthenware basins with water laid on from an iron cistern, into which it should be pumped from the tank. Additional fresh water bath accommodation is also required for cleanliness. There are abundant opportunities for sea bathing. The soft stone troughs of the latrines should be replaced by Macfarlane's iron or Jennings' stone-ware latrines and urinals, and water should be constantly supplied to them. As

the supply of fresh water is limited, salt water should be pumped up for this purpose. Additional rain water tanks should be constructed to receive all the roof water which can be collected. The guard room requires more ventilation. The defects in the flues of the cook-house were pointed out at the time, and we believe they have been remedied.

The barrack accommodation has recently been extended by the erection of a number of large old wooden huts, brought from Gozo. They have been unfortunately placed across the line of drainage, on the steep sloping ground, which has been terraced to afford space for them. It is probable that these huts will not prove so healthy as the stone barracks, although considerable pains have been taken to isolate them from the surrounding ground.

Pembroke barrack affords a great contrast to all the other barracks in the island. Most of the recent sanitary improvements have been introduced into the plans, and the site is a very good one. By sending the troops to it in rotation, it will become a species of sea-side sanitarium, the use of which will no doubt tell advantageously on the general health of the garrison.

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### 23.—General Hospital, Valetta.

This hospital is one of the most complicated buildings we have seen, and one of the most ill-arranged and unsuitable places for the sick of a garrison in existence.

It is situated on the south-east side of Valetta, close to the Great harbour, from which it is separated by a narrow public road and wall. The site is the lowest on that side of the town, and all the ground falls towards it.

There is an apparent advantage of position derived from the proximity of part of the sick wards to the sea; but in a climate like that of Malta, where sanitary condition depends so much on the nature of the winds, this advantage is neutralized and converted into a disadvantage by the circumstance that all healthy winds are cut off from the building, partly by its bad construction, partly by its being enclosed on three sides by a densely packed neighbourhood of lofty houses, and also because the lofty works of Fort St. Elmo intervene between the site of the hospital and the north and north-westerly winds, which are the really healthy winds. The only wind that blows directly on the sick wards is the sirocco, a well-known cause of indisposition at Malta, and the effect of which is immediately perceived on the sick. The site is hence exposed only to unhealthy winds; and at all other times there is more or less stagnation of air about it, unless there is stormy weather.

Nothing in the construction tends to redeem this defect of position, but on the contrary; for the construction is bad in two essential matters: first, it consists of two courts, one of them 34 feet below the level of the other; secondly, both courts are closed at the angles, a form of construction which renders external ventilation very difficult at any time; and the lower court, that from which the ventilation along one side of a number of the sick wards is derived, is a sunk area or well about 50 feet deep, measured from the roofs of the surrounding buildings.

There is no free circulation of air through this court except such as comes over the tops of the buildings. It is the only place where convalescents can take exercise. It was being improved in appearance by having a few trees and shrubs planted in it while we were there; a praiseworthy attempt to render the place more cheerful, but very likely, if the trees should grow up, to impede still further the ventilation and render the air more damp.

The following is the general arrangement of the hospital buildings:—

The principal entrance is at the bottom of the steep slope of the Strada Mercanti. It is through an arch, leading into a square paved court, enclosed by buildings two floors in height, containing officers' quarters, offices, pharmacy, apothecaries' stores, guard room, &c. The upper floor on one side is occupied by sick wards. At the north-eastern corner of this square there is a large arched doorway with a spacious flight of some 20 stone steps, enclosed in the buildings, leading down to the main hospital. These steps end in an arched corridor passing round the lower court at about half the height of the surrounding buildings. The lower court, which is closed and of a square form, is seen by looking over the corridor. One side of this court is cut out of the solid rock, the face of which is covered with patches of green vegetation, marking the presence of damp, and also of malaria in a warm climate. The other sides are principally formed by the hospital.

On the side next the upper square the corridor gives entrance to a number of dark, damp rooms; some of little or no use except to harbour foul air or dirt. One of these, at the end furthest from the entrance, was being fitted up as a bath and ablution room;

perhaps the best available place for such accommodation, but nevertheless not a place where sick men or convalescents ought either to wash or bathe. The baths used formerly to be in the upper square, quite away from the sick. Opposite the door of this bath room are the hospital privies, which were most offensive, and diffused their odour right and left along the open corridor.

The opposite side of the square is bounded by a long lofty building two floors in height. The lower floor, opening from the ground level of the lower court, is below the level of the ground outside, and contains stores of various kinds, the kitchen, disused stables, the dead-house, ablution room, &c. The upper floor is entered from the corridor, and contains one long lofty ward. The other two sides of the square are occupied mainly by sick, but partly also by stores and non-commissioned officers' quarters. This is, however, not the whole of the accommodation for sick. The long ward fronting the sea occupies only half the length of the hospital on that side. The building is prolonged to the south-east in the same front, and contains another long ward, facing the sea on one side, and almost blocked up along the opposite face by a line of stores built up against it, and by the narrow populous streets that environ it.

A very important disadvantage attending the length and position of the buildings is, that one of the main town sewers, draining a considerable district, passes directly under the middle of the hospital, while other two of the town sewers pass one at either end. These sewers all open above water mark, and give rise to most offensive odours during certain states of the weather. The lower floor of this part of the building is charged with foul air throughout, and at some parts it is scarcely safe to remain in the places for any length of time. The buildings were formerly the hospitium of the Knights, they are very old, and are supposed to have been amongst the earliest erected outside St. Elmo.

The following table gives the ward accommodation:—

Date of Construction, A.D. 1575.
Number of Wards, 20.
Regulation Number of Beds, 382.

| Wards. | Regulation Number of Sick per Ward. | Dimensions. | | | | Cubic Feet per Bed. | Superficial Feet per Bed. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | Cubic Contents. | | | Number. | Average Height. | Average Width. |
| No. | | Ft. in. | Ft. in. | Ft. in. | Ft. | | | | Ft. in. | Ft. in. |
| 13* | 8 | 21 0 | 17 7 | 16 0 | 5,904 | 738 | 46 | 2 | 6 0 | 2 7 |
| 14 | 7 | 20 0 | 17 6 | 16 0 | 5,600 | 800 | 50 | 1 | 6 0 | 2 7 |
| 17 | 42 | 96 0 | 30 0 | 23 4 | 67,200 | 1,600 | 68 | 13 { 6 / 7 | 7 5 / 1 5 | 3 8 / 3 0 |
| 18 | 4 | 30 6 | 17 0 | 15 4 | 7,950 | 1,987 | 129 | 3 | 3 3 | 3 7 |
| 19 | 3 | 23 4 | 17 0 | 15 4 | 7,536 | 2,512 | 132 | 2 | 3 3 | 3 7 |
| 22 | 9 | 50 0 | 18 6 | 13 8 | 12,641 | 1,404 | 102 | 4 | 6 0 | 3 5 |
| 39 | 26 | 98 4 | 29 7 | 30 6 | 88,724 | 3,412 | 111 | 8 | 5 7 | 3 0 |
| 40 | 7 | 26 0 | 17 6 | 17 4 | 7,886 | 1,126 | 65 | 4 | 5 10 | 2 11 |
| 41 | 7 | 37 0 | 17 6 | 17 4 | 11,214 | 1,602 | 92 | 4 | 5 11 | 2 11 |
| 42 | 5 | 29 0 | 17 6 | 17 4 | 8,788 | 1,757 | 101 | 3 | 5 2 | 2 11 |
| 50 | 34 | 90 8 | 32 11 | 25 8 | 53,309 | 1,567 | 61 | 7 { 5 / 2 | 6 9 / 3 6 | 3 4 / 3 3 |
| 52 | 6 | 34 6 | 19 2 | 16 8 | 11,016 | 1,836 | 110 | 3 | 6 4 | 3 7 |
| 56 | 13 | 49 7 | 31 0 | 13 4 | 20,493 | 1,576 | 118 | 6 { 5 / 1 | 5 3 / 2 8 | 4 4 / 1 8 |
| 57 | 11 | 21 0 | 21 4 | 19 8 | 8,810 | 300 | 40 | 2 | 7 2 | 3 2 |
| 58 | 13 | 59 0 | 18 6 | 19 5 | 21,183 | 1,629 | 83 | 6 { 5 / 1 | 6 8 / 3 0 | 3 10 / 1 8 |
| A. 58 | 5 | 23 0 | 19 9 | 19 6 | 8,853 | 1,770 | 90 | 2 | 6 8 | 3 11 |
| 60 | 14 | 42 8 | 34 10 | 30 6 | 45,323 | 3,237 | 106 | 3 | 5 6 | 3 1 |
| A. 60 | 22 | 73 0 | 34 10 | 30 6 | 77,531 | 3,524 | 115 | 5 | 5 6 | 3 1 |
| B. 60 | 34 | 110 0 | 34 10 | 30 6 | 116,845 | 3,436 | 112 | 5 | 5 6 | 3 1 |
| C. 60 | 110 | 275 0 | 34 10 | 30 6 | 292,159 | 2,655 | 87 | 19 | 5 6 | 3 1 |

* A small closet containing two beds, opening out of No. 13, is not included; 13 and 14 are prisoners' wards.

The data in this table are sufficient to show the extraordinary irregularity of the building. The wards are of all sizes and heights, and afford every variety of cubic space and superficial area to the sick. In most of the wards both of these requisites are very much greater than would be necessary in a properly constructed hospital.

But on the other hand most of the cubic space is useless for any sanitary purpose, as it is quite above the beds, and from 15 to 30 feet above the point where it would be useful to the patients.

The great breadth of the lower wards, and the consequent distance between opposite windows, are also most injurious to ventilation.

Another remarkable point in the construction is the entire disproportion between the window space and the cubic contents of the wards. About 50 square feet of window space for every 3,000 cubic feet of contents are necessary to admit the required amount of light and air to sick wards in such a climate as Malta; while the window space of the more important wards is only from one-fifteenth to one-twentieth part of this proportionate area, and as a consequence the wards are dark and dismal, besides being close, and the air always more or less stagnant. The windows, small as they are, are all close to the roof, so that there is nothing for the sick to look at, not even the sky, besides the dead walls and their sick comrades opposite. Medical officers complain of the bad moral effect produced on the sick by the want of light and view, and state that their patients come gradually to concentrate their whole thoughts on their maladies.

In so far as regards the sanitary state of this hospital arising out of its site and construction, there cannot be a doubt that it is very bad. Sick men recover very slowly in it. Zymotic diseases, such as fevers, become more severe and fatal while the sick are in it, and pass from the simple continued into the typhoid form. All this has been long known to observing medical officers; and lately it has been found necessary to open a sanitarium, as it is called, at Citta Vecchia, for the reception of fever cases from this very hospital, in order to save their lives. Such cases recover rapidly at Citta Vecchia, while they linger or die in the General hospital. This is a sure mark of the real state of the place, and of its unfitness for sick. But more than this, during the last epidemic of cholera at Malta, most of the cases among the troops happened in the General hospital, just where they might have been expected to happen.

*Ventilation and Warming.*—There are no special means of ventilation, except the windows and a number of small perforated plates about 9 inches square along the walls of the larger wards. These means are quite insufficient for preserving the air pure and in motion. Nettleton's stoves are used for warming, but in their present form they are open to the objection of not admitting warm *fresh air* into the wards.

*Water Supply.*—Rain water for the use of the hospital is collected in tanks. Water from the aqueduct could also be had if required. The water for hospital use is stated to be good, and sufficient in amount.

*Drainage.*—The drainage of the hospital is far from being in a good state, as was evidenced by the very offensive odours prevailing in certain parts of the basements, and also near the latrines. The outlet is into the sea 14 feet above water mark, and much nuisance is experienced from it in the hospital itself. There is no surface drainage of the lower court. The rain-fall percolates through the spongy sandstone, and escapes at a lower level.

*Latrines.*—The principal latrines are those already described; they are of the usual Maltese construction, and very offensive. There are one or two others elsewhere. But, connected with the wards, there are no water-closets for the sick, many of whom have to walk a considerable distance to reach the accommodation, such as it is. The latrine drainage is stated to be constantly out of repair, and the latrines are said to be connected with cesspits.

*Ablution and Bath Accommodation.*—As already stated, a bath and ablution room was being constructed at the time of our inspection. The arrangements are far from being satisfactory, but are on the whole as good as any others that could be made in such a building.

*Washing.*—There is no wash-house. All the hospital linen is washed by contract.

*Stores.*—As this hospital is partly administered on the regimental system, each regiment has its own stores.

*Cook-house.*—Until lately each regiment had also its own kitchen. A general cook-house for the whole hospital has since been provided.

*Serjeants' and Orderlies' Accommodation.*—Each serjeant has a room for himself and family, often quite away from the sphere of his duties. The orderlies sleep in the wards with the sick. All the arrangements are bad, and cannot be altered in the present building. Indeed anything like proper hospital administration is impracticable in such a building, unless the whole internal construction were altered.

*Exercising Ground.*—There is none except the corridors and the damp confined area of the lower court of the hospital overlooked by the corridors.

Considered merely as a building this hospital might no doubt be made less injurious to sick than it is at present. All useless parts might be cleared away: portions of the buildings might be removed to simplify the construction, and to admit fresh air. The large wards might be improved, by greatly increasing the window space, and by suitable

ventilation. Divisions might be carried up in them so as to cut off suitable wardmasters' and orderlies' rooms and sculleries. Proper water-closets and baths with wash-hand basins might be provided contiguous to the wards.

These improvements would, if thoroughly carried out, reduce materially the amount of accommodation for sick, unless the whole front of the building were raised by an additional story; but this addition would infallibly lead to greater stagnation of air in the courts. The expense besides would be very large; and after the alterations were all carried out the site would be as confined and as unhealthy as it is at present.

While we were at Malta the Commanding Royal Engineer proposed to increase the external ventilation by removing certain buildings at a trifling cost, a proposal in which we entirely concurred.

We would, in addition, recommend the enlarging of the existing windows, or rather opening fresh ones under them on a level with the beds, to improve the light and ventilation of the large wards. All the wards should be provided with a sufficient number of Muir's ventilators along the ridge, and inlets for fresh air at the eaves. Macfarlane's or Jennings' latrines should be introduced instead of the present privies, and drained by earthenware pipes. The outlet into the sea should be by an iron pipe carried into deep water.

These alterations, which would involve only a small outlay, would somewhat diminish the unhealthiness of the hospital, but they cannot be considered as in any sense rendering it fit for a garrison hospital, and sick would still have to be sent to Citta Vecchia or St. Julien's bay for recovery. We have already stated our opinion that a new hospital for 300 beds should be erected on St. Michael's bastion, and that the present building, when improved in the manner we have recommended and otherwise altered, would be suitable for extending the barrack accommodation so much wanted in this locality.

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## 24.—Vittoriosa Hospital.

This hospital is situated at the south-eastern extremity of Vittoriosa, immediately within the works, and close to a cavalier. It is a large building, of very singular construction, originally built in the time of the Knights, not for human habitation, but for a district armoury. The site is the highest in the neighbourhood, and the flat roof of the building overlooks all the neighbouring houses, by which it is closely surrounded without any enclosure except at the front. We have been informed by an eye-witness that in consequence of this absence of enclosure he has often seen the patients smuggle spirits and fruit into the hospital by means of a cord let down from a window to the street. The lower floor is completely embedded among narrow streets of houses, which cut off the ventilation and darken all the rooms. The ground occupied by the building is on a slope, and the ceilings of the ground-floor rooms are nearly on a level with the higher end of the site, so that in order to reach the ground floor a flight of steps has to be descended to a small close court, out of which the ground floor is entered. Opening into the court are six small casemates, three on each side, used as cook-houses, orderlies' room, ablution room, privy, &c. At the end of the court is a large door giving access to a ward 74 feet long, by 23 feet 10 inches wide. This room has only one window, at the end opposite the door, opening into a narrow street, and having a high wall opposite to it. Out of this central ward there open eight small wards, four on each side. These rooms have each one small window close to the ceiling. The arrangement of this floor is exactly that of an ordinary cellular prison, except that it would be considered a very bad example of the arrangement.

Over this central corridor with its cells are the upper wards of the hospital, which are reached by an outside stair carried up one side of the court already mentioned. The wards are three in number, corresponding with the central ward and the two ranges of cells below. Two of the wards, being on the outer side of the block, have each five windows to the outer air along one side, and one window at the end. The ward between them, like the large one on the ground floor, has a window only at the end opposite the door, and it communicates with each of the side wards by two doorways carried through the division walls. On the same level with these upper wards, are a series of small rooms built over those in the sunk court below, devoted to serjeants' quarters and surgeries. As the hospital is intended for the sick of two corps, there are the customary duplicate sets of offices and rooms.

Besides the hospital accommodation in this block of building, there are other two wards in the adjacent cavalier, literally embedded in the mass of the work. One of these wards is 81 feet 8 inches long and 23 feet broad, and it is cut off from the external air

by a wall 36 feet in thickness. The only light which this cavern, for it is nothing else, receives is by the door, and by two slits in the wall 3 feet high and 10 inches broad bevelled inwards through the entire thickness of the wall to a height of 7½ feet by 3 feet broad. There are also two small air-shafts in the roof.

The other ward is 39 feet by 18 feet, and is interposed between part of the long ward and the outer air. It is in fact excavated out of part of the 36 feet wall. It has only one slit opening to the outer air. Between these two parts of the hospital there is an enclosed court with a covered ambulatory on one side of it for convalescents; but as there is no view from it, and the place is otherwise dull, and the dead-house is on one side of it, convalescents prefer ascending to the top of the hospital, where they can obtain better air and a view.

There are two disadvantages attending this however: first, there is no parapet to the roof, and a weakly man if he stumbled close to the edge would fall over and be certainly killed; and, secondly, the men smoke and spit on the roof, and the rain-fall washes the whole of the filth down into the water tanks from which the hospital is supplied with water.

There are altogether 13 wards with 108 beds in the hospital proper, and two wards with 38 beds in the cavalier. The wards are, however, very unequally occupied, the number of wards in use, good and bad, depending on the strength of the corps, and on the number of sick. The whole place would be occupied if necessary, especially during epidemics, when the very best class of accommodation is required, and when the worst would be brought into use. The following table gives the statistics of the wards occupied at the time the return was made:—

| Rooms. | Regulation Number of Beds per Ward. | Dimensions of Wards. | | | Cubic Feet per Bed.* | Superficial Area per Bed. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| Nos. | | | | | | | | | |
| 4 and 6 each | 23 | 90 5 | 21 3 | 9 3<br>14 0 | 1,169 | 82 | 2<br>4 | 10 0<br>8 10 | 5 0<br>3 9 |
| 5 | 20 | 71 0 | 22 11 | 8 9<br>16 6 | 1,138 | 78 | 1<br>1 | 10 0<br>6 0 | 5 0<br>4 6 |
| 9*a* | 7 | 21 0 | 13 9 | 8 0<br>13 6 | 577 | 32 | 1 | 8 10 | 3 5 |
| 10 | 22 | 72 0 | 22 10 | 11 6<br>8 10 | 1,046 | 72 | 2 | 4 10 | 3 8 |
| 10*a* | 7 | 21 0 | 13 9 | 8 0<br>13 6 | 570 | 32 | 1<br>1 | 5 7<br>5 7 | 9 6<br>5 2 |
| In the Cavalier. 14 | 26 | 63 0<br>19 0 | 26 6<br>19 2 | 10 3<br>5 0<br>7 3<br>10 9 | 993 | 66 | 2 | 3 0 | 0 10 |
| In the Cavalier. 15 | 12 | 29 4 | 14 11 | 9 1<br>10 5 | 510 | 30½ | 1<br>1 | 5 0<br>3 3 | 4 6<br>0 10 |

* Calculated at an average height of 14 feet.

Of the whole 15 wards there are only three, Nos. 4, 5, and 6, on the upper floor of the main building, in which sick ought to be placed at all. The remaining wards are absolutely unfit for human habitation in such a climate, and should at once be struck off the construction.

The place will, therefore, hold 66 sick at the utmost; and not another bed should be allowed in it. Better put sick men in wooden huts or in tents on the cavalier than expose them to such risks as they incur in these bad wards.

Besides the bad nature of the accommodation, the building is deficient in many essential hospital requisites which would have to be supplied if it is to be used at all. These we next proceed to describe.

*Ventilation and Warming.*—There are no special means of ventilation for the three habitable wards, and the windows are much too small. To remedy these defects, shafts should be carried up through the roof of each ward, and inlets should be provided as high up as possible in the outer side walls. The middle ward being between the others, a large inlet should be made at each end close to the top of the arch. The heads of all the windows should also be carried up nearer the roof, and the sills of the windows lowered. There are fireplaces, but iron stoves with pipes are used instead of open grates, which is by no means so good an arrangement.

*Drainage.*—Like the generality of Maltese drains, those connected with this hospital are merely deep cuts in the soft porous sandstone rock, covered over. A main drain of this construction passes along three sides of the hospital immediately outside the walls. The surface-water drains, and those from the latrines, are connected with this main, which has its outlet into the head of Calcara creek, about 200 yards distant. There is a very great fall for the drainage, and if the sewers were properly constructed they ought to act efficiently. Such, however, is not the case, for at times there is great nuisance from the hospital drains, especially during westerly winds, which carry the effluvia into the hospital wards. The evil might be prevented to a considerable extent by trapping all the gulley grates in and about the hospital, and by carrying a ventilating shaft from the sewer 10 or 12 feet above the roof of the hospital; but the only efficient remedy would be to reconstruct the sewers, with due regard to material and dimensions.

*Latrines.*—There are no water-closets attached to the sick wards. The only conveniences for the sick are latrines situated in the lower court, to which the sick have to descend two flights of steps, mostly in the open air and exposed to the weather. The latrines are situated in a dark damp casemate not suitable for weakly men to resort to. They are of the usual construction, and supplied with water from a tank and pump in the lower court. They are flushed out into the sewer.

It is indispensably necessary, if this hospital is to be occupied, that water-closets adjoining the upper wards should be provided. The only urinal is in the same casemate with the latrines.

*Water Supply.*—Water is derived from two sources,—the public aqueduct, and rain-water collected in tanks. The supply is stated to be abundant and good, provided care be taken to cleanse the tanks every season, and to keep the roof clean.

*Ablution and Bath Accommodation.*—The only accommodation of the kind is in a dark damp casemate, next door to the latrines in the lower court yard. It is open to the same objection as to position which applies to the latrines. The room has a damp stone floor, and stone washing troughs along the wall. The only baths are slipper baths, which, when filled with cold water, are used in this room; but if a warm bath is required, the tin slipper bath has to be carried up to the wards, and hot water is carried in pails from the kitchen below. The arrangements are most unsatisfactory, and should be changed. Provision should be made on the upper floor for a proper ablution room, with fixed basins and fixed baths, with hot and cold water laid on.

*Cook-houses.*—The hospital kitchen opens out of the lower court. It is in a casemate not well adapted for the purpose. It contains an oven, kitchen range with boiler, and four coppers. The means of cooking are sufficient, but complaint is made as to the defective nature of the cooking on account of constant change in the regimental cooks. This defect will be remedied under the new organization of the Army Hospital Corps.

*Hospital Attendants.*—The accommodation for hospital attendants is very deficient; but it might be improved if all the wards were closed except the three upper ones. If the surgeries were removed from the upper floor space might be found for water-closets, ablution and bath room, and for the necessary attendants.

*Accommodation for the Sick of Soldiers' Families.*—There is none such, although it is very much wanted. The medical officers state that the married quarters in the fortini are so inferior that it is hardly possible to attend sick in them with any prospect of doing justice to the patients. A similar remark applies to confinements. The medical officers state that it would be a great charity if some form of female hospital were provided. The best way of doing this for Malta would be to provide a room with suitable conveniences in connexion with each block of married soldiers' quarters, into which sick women and children could be moved for treatment.

The commanding officer at Vittoriosa had placed funds in the hands of the medical officer, to enable him to obtain the assistance of a nurse for the women.

We have already recommended that a new hospital be built for the barracks on the Cotonera side, in place of the buildings now in use, which are unfit for sick. Were this done, Vittoriosa hospital would afford a certain amount of useful barrack accommodation if it were rendered fit for the purpose.

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### 25.—Hired Hospital, Vittoriosa.

This hospital is situated at the bottom of a narrow lane called Strada San Georgio, at a short distance from Vittoriosa Hospital. It consists of two adjoining private houses of the usual Maltese construction, occupying sloping ground, and close to Dockyard creek.

One of the houses is three floors in height; the other has two floors. The ground floor of No. 2 house is occupied by private families. On the lower floor of No. 1 house is the surgery, serjeant's room, cook-house, ablution room, and coal stores. Under this is the dead-house and three unoccupied cellars. There is a small, damp, dull court in the middle, out of which a number of close dark rooms open, used for various purposes.

The sick wards are all on the upper floors, which are the only favourable points about the buildings. In every other respect they are unsuited for hospital purposes, and cannot be made suitable. They can only be considered as affording temporary refuge for sick men until suitable accommodation can be provided for them.

The following table gives the accommodation:—

| Wards. | Number of Beds per Ward. | Dimensions of Wards. | | | Cubic Feet per Bed. | Superficial Feet per Bed. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| *No. 1 House.* | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 4 | 16 5 | 16 3 | 16 9 | 896 | 64 | 1 | 9 0 | 4 0 |
| 2 | 9 | 30 6 | 17 7 | 22 0 | 793 | 56 | 1 | 10 4 | 4 2 |
| 3 | 5 | 18 6 | 16 3 | 17 6 | 806 | 57 | None. | — | — |
| 4 | 5 | 18 6 | 15 0 | 16 8 | 756 | 54 | 1 | 6 8 | 3 5 |
| 5 | 5 | 18 7 | 15 2 | 16 9 | 756 | 54 | 1 | 6 8 | 3 5 |
| *No. 2 House.* | | | | | | | | | |
| 6 | 20 | 63 0 | 23 1 | 23 9 | 1,014 | 72 | 3 | 6 8<br>6 8<br>9 0 | 3 5<br>3 5<br>4 0 |
| 7 | 4 | 10 8 | 13 4 | 13 6 | 455 | 32 | 2 | 5 9<br>4 9 | 5 3<br>3 7 |
| 8 | 4 | 24 4 | 14 8 | 22 0 | 1,176 | 84 | None. | — | — |

The table is sufficient to show the very defective construction of the rooms, and the extent of overcrowding which prevails in them. Considered as temporary accommodation, the rooms have space for about 40 sick, instead of 56, the present regulation number.

*Ventilation.*—There are no special means of ventilation, except a small opening here and there. Each ward should have a properly constructed shaft carried up through the roof, and openings should be made in the outer walls close to the ceiling, so as to ensure as efficient a circulation of air as possible.

*Warming.*—There are no means of warming, and only one ward has a fireplace. Perhaps the easiest way of supplying the deficiency temporarily would be by stoves constructed to admit fresh warmed air.

*Latrines.*—There are no water-closets to the wards, but there is a set of stone latrines of the usual Maltese construction placed on the second floor, and connected by a gallery with both houses. They are supplied with water by a force-pump, and drained into the sewers. These latrines are in the narrow inner court, and have no means of ventilation. Any foul air from them would make its way into the general atmosphere of the wards. The urinals are not beside the latrines, but are on the ground floors of each house.

*Drainage.*—There is a good fall for the drainage into the adjacent creek. The sewers are of the usual construction, and all the hospital drains are said to be trapped.

*Water Supply.*—Water is derived from rain-fall collected in tanks in the usual way.

*Ablution and Bath Accommodation.*—The ablution room for the sick is a damp basement, with basins on a stone bench. It is by no means a place to be frequented either by sick or convalescents. There is no proper bathing accommodation, only two Maltese stone baths in a cellar, which have to be reached by going outside. Slipper baths are used in the wards for patients too ill to go outside. There is a shower bath.

*Cook-house.*—The cook-house is under the sick wards. It is fitted up with three boilers, a range, and two baking ovens.

Considering these houses as merely affording temporary accommodation for sick, we cannot recommend any expenditure, except for ventilation, which is always of immediate necessity. The place should be evacuated as speedily as circumstances will admit.

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## 26.—Spinola Hospital.

This hospital, which has recently been formed in the Spinola Palace, is situated at the head of St. Julien's bay, and at a short distance to the east of St. George's camp, for the sick of which it is intended to afford accommodation.

The palace is a moderately sized cubical block of building within a large garden, and occupies a healthy position. It wants, of course, many of the qualifications required for a proper hospital, but the sick have nevertheless the benefit of fresh air, which is an advantage denied to the great majority of those treated in the garrison hospitals.

There are wards on three floors, namely, on the ground floor, on the half landing, and on the upper floor. The kitchen, surgery, and stores are on the ground floor, and the water-closet, ablution, and bath accommodation are at the top of the stairs under the roof. The purveyor's store is in the basement, and the bedding store in the yard.

The following table gives the accommodation:—

| Wards. | Number of Beds. | Dimensions of Wards. | | | | | | Cubic Feet per Bed. |
|---|---|---|---|---|---|---|---|---|
| | | Length. | | Breadth. | | Height. | | |
| No. | | Ft. | in. | Ft. | in. | Ft. | | |
| 1 | 9 | 27 | 0 | 20 | 4 | 14 | | 854 |
| 2 | 3 | 16 | 9 | 14 | 9 | 14 | | 1,153 |
| 3 | 4 | 16 | 7 | 14 | 10 | 14 | | 860 |
| 4 | 4 | 30 | 9 | 11 | 0 | 14 | | 1,183 |
| 5 | 6 | 30 | 9 | 15 | 7 | 14 | | 1,114 |
| 6 | 9 | 30 | 4 | 20 | 5 | 14 | | 963 |
| 7 | 3 | 17 | 6 | 15 | 9 | 14 | | 1,286 |
| 8 | 3 | 17 | 6 | 15 | 9 | 14 | | 1,286 |
| 9 | 1 | 12 | 9 | 9 | 0 | 14 | | 1,606 |
| Orderlies' | 1 | 18 | 3 | 11 | 4 | 14 | | 2,895 |

It will be seen that two or three of the wards are rather crowded. The space in them should be raised to that in the others by removing some of the beds.

*Ventilation.*—The window space in most of the wards is tolerably good, though not so large as it would be in a properly constructed hospital. Shafts have been carried from the upper wards through the roof. The lower wards require additional ventilation, by shafts carried from the ceiling above the roof. All the wards should have large louvred inlets close to the ceiling. None of the wards have fireplaces.

*The Ablution and Bath Accommodation* are most inconveniently situated, as is also the water-closet. Patients from the lower floor have to ascend the whole height of the house to reach them. This defect could only be remedied by removing these conveniences to suitable projections thrown out from different floors of the building, and cut off from the building by a ventilated lobby having a window on each side. In their present position both ablution room and water-closet require more ventilation. The boiler for supplying the bath with hot water is said to be too small.

The outside latrines are in a low dark building, without a door and without sufficient ventilation. They are of the usual construction and should be replaced by iron or earthenware latrines. The other defects should also be remedied.

The kitchen has a Flavel's cooking range.

Immediately outside the building at one end there is a long steep flight of steps, leading down to an immense subterranean cavern hollowed out of the porous rock. The floor of this excavation is covered with water, filtered through the stone, and affords a supply for the hospital.

This hospital affords good accommodation of a temporary kind, and, admitting its inconveniences, it is a useful building in the present very defective state of the garrison hospital accommodation. The improvements we have suggested will materially add to its salubrity at a small cost.

## 27.—Sanitarium, Citta Vecchia.

This establishment occupies the old "Palace of Justice" (La Corte Capitanale) of the grand masters at Citta Vecchia. It is a large building situated on the eastern edge of the high rocky ridge which traverses the island about 7 miles from Valetta. It is exposed to all the cool breezes, and enjoys a much cooler climate than the less elevated parts of the island. The palace is built with a fore-court to the street, and an enclosed court within, and is entered by a flight of steps leading up to the first floor, on which the principal suite of apartments is situated. This consists of a series of lofty rooms of different sizes connected by doors; having large windows, several of which command extensive and beautiful views. The eastern suite of rooms has a balcony running along its front, on which all the windows open.

Except on the eastern side, the palace is hemmed in by other buildings, and on the south by a lofty bastion nearly as high as its roof. There is access to this bastion from the hospital, and it forms a very good place for convalescents taking exercise.

On the upper floor are a number of small low rooms like ordinary bed-rooms, several of which have been set apart for sick. They were not occupied at the time of our inspection, and they certainly do not afford accommodation at all equal to that on the floor below.

The following table gives the accommodation as at present allotted for 88 beds:—

| Number of Wards. | Regulation Number of Sick per Ward. | Dimensions of Wards. | | | Cubic feet per Bed. | Superficial feet per Bed. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| | | Ft. in. | Ft. in. | Ft. in. | | | | Ft. in. | Ft. in. |
| 1 | 4 | 23 10 | 17 9 | 23 7 | 2,492 | 106 | 2 | 9 0 | 3 5 |
| 2 | 8 | 33 9 | 24 0 | 25 7 | 2,588 | 101 | 1 | 4 0 | 2 0 |
| | | | | | | | 3 | 8 3 | 3 5 |
| 3 | 4 | 24 0 | 19 8 | 24 8 | 2,907 | 118 | 2 | 8 6 | 3 6 |
| 4 | 5 | 23 11 | 22 6 | 22 4 | 2,402 | 107 | 2 | 8 6 | 3 6 |
| 5 | 5 | 30 0 | 18 4 | 21 7 | 2,374 | 110 | 1 | 3 0 | 3 0 |
| | | | | | | | 2 | 9 6 | 3 6 |
| 6 | 14 | 55 4 | 27 0 | 32 0 | 3,414 | 106 | 2 | 15 3 | 3 6 |
| | | | | | | | 2 | 9 6 | 3 6 |
| 7 | 7 | 27 2 | 27 1 | 26 7 | 2,794 | 105 | 1 | 15 3 | 3 6 |
| | | | | | | | 1 | 9 6 | 3 6 |
| 8 | 5 | 24 7 | 21 10 | 24 10 | 2,665 | 108 | 1 | 15 3 | 3 6 |
| | | | | | | | 1 | 9 6 | 3 6 |
| 9 | 6 | 34 4 | 20 6 | 24 7 | 2,883 | 116 | 1 | 7 4 | 3 8 |
| | | | | | | | 1 | 8 6 | 3 6 |
| | | | | | | | 1 | 3 0 | 3 0 |
| 10 | 4 | 32 2 | 15 2 | 20 10 | 2,544 | 122 | 1 | 7 5 | 3 11 |
| | | | | | | | 2 | 3 6 | 2 3 |
| 11 | 3 | 27 2 | 13 9 | 14 7 | 1,815 | 124 | 1 | 7 0 | 3 6 |
| | | | | | | | 1 | 6 0 | 3 0 |
| 12 | 4 | 35 0 | 14 3 | 14 7 | 1,818 | 124 | 2 | 6 9 | 3 5 |
| 13 | 2 | 19 0 | 14 3 | 11 2 | 1,518 | 135 | 1 | 5 6 | 3 0 |
| | | | | | | | 1 | 3 9 | 3 5 |
| 14 | 2 | 21 0 | 14 4 | 11 3 | 1,693 | 150 | 2 | 4 10 | 3 5 |
| 15 | 2 | 23 3 | 12 9 | 11 3 | 1,667 | 148 | 1 | 4 10 | 3 5 |
| 16 | 3 | 30 6 | 14 0 | 12 2 | 1,731 | 142 | 2 | 4 10 | 3 4 |
| 17 | 8 | 51 0 | 19 0 | 11 3 | 1,362 | 121 | 4 | 4 7 | 3 0 |
| 18 | 2 | 24 6 | 11 0 | 11 4 | 1,642 | 134 | 2 | 4 9 | 2 4 |

All the wards have ample space and superficial area for the sick; and although some of them are better than others, the worst of them, taking their healthy position into account, are much better than the best wards in the garrison.

*Ventilation.*—This is effected at present by doors and windows. If these were always used there would be no need of other means of renewing the air, but as they may be shut, especially in wet weather, it would be proper to ventilate all the first floor wards by louvred inlets close to the ceilings, and by shafts carried from the ceilings above the roof, terminating in louvred turrets, and to improve the ventilation of the wards on the upper floor by shafts, and louvred inlets for fresh air.

On the ground floor is the kitchen, stores, &c. Water-closets, have been provided for the sick in proximity to the wards above. These were complained of as being offensive at times. They had been so placed, apparently from necessity, that the sick of several wards had to pass through the ward next the closets. It would be a great improvement if these closets could be removed and placed elsewhere.

This sanitarium has been of very great use to the sick of the garrison. Indeed, except the Spinola Hospital, it is the only place where fever cases have a fair chance of recovery; and it has become the custom to remove such cases to Citta Vecchia, with the certain expectation of immediate amendment. Ophthalmia and chest complaints do not benefit so much by the change as fever cases do, apparently from the too great change of climate.

We are of opinion that this sanitarium ought to be continued, and that even after the improved hospitals we have recommended are built the sanitarium will be of great service to the garrison.

## 28.—Sanitarium for Officers at Citta Vecchia.

Some time ago a private house at Citta Vecchia was taken for a sanitarium for officers suffering from ill health; but it has been little used on account of its gloomy uncomfortable appearance, and it is proposed to take another. The present building is long and narrow, and only one end of it overlooks the country, the remaining sides being completely enclosed by houses, and the rooms have no view and are deficient in light and cheerfulness. The place is never likely to be resorted to by convalescents. The house which it has been proposed to take is on the ramparts with a cheerful view in all directions, but there has been some difficulty about a few pounds of additional rent. This should be arranged, for independently of the saving in efficiency among officers by having a place they can go to for the purpose of regaining health instead of coming home, a house would be had worth the money, whereas the rent at present paid, small as it is, is money thrown away so far as any benefit is concerned.

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## 29.—Fort Chambray, Gozo.

Fort Chambray covers the summit of a rocky hill overlooking the sea on the eastern side of the island of Gozo, above the village of Ghain Sielem. It is open to the sea breeze in all directions, and ought to be a very healthy spot. There is a very considerable unoccupied area within the works, and the barracks, which were built in the time of the Knights, are in a single cubical block at one side of the fort near the gate. During a recent earthquake, although the barracks do not appear to have been damaged, a large massive curtain close to them on the north was rent across in two places and moved outwards, so that the gun platforms sunk down several feet, on account of the whole mass of the curtain having been separated from the ground behind it.

The barracks are of a somewhat singular construction. They are in two floors, with four casemated rooms on each floor. These rooms are from 18 to 20 feet broad, from 12 to 14 feet in height, and no less than 100 feet in length. They have a single window at each end, so that the windows are 100 feet from each other. The rooms are hence more like long narrow passages or tunnels than barrack rooms. The lower rooms have doors at the ends; the upper rooms have no separate doors, but there is an entrance in the middle of the length of each outside room, and the inner rooms are reached by corresponding doors in the division walls. Each room has regulation space for 50 men, at from 432 to 588 cubic feet, and from 36 to 41 square feet per man. The beds are arranged along the dead walls between the windows.

Besides these long barrack rooms, there are rooms for six non-commissioned officers, and three staff serjeants, constructed against the outer side walls of the outer barrack rooms. These are small, and in several floors reached by stairs. Each room has a window in the outside wall.

The following table gives the accommodation:—

| Rooms. | Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. |
|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | |
| No. | | Ft. | Ft. in. | Ft. in. | | |
| 1 | 50 | 100 | 18 0 | 12 0 | 432 | 36 |
| 2, 3, 5, | 50 | 100 | 19 0 | 14 0 | 532 | 38 |
| 4 | 45 | 100 | 18 0 | 11 7 | 464 | 40 |
| 6 | 50 | 100 | 20 6 | 14 0 | 588 | 41 |
| 7, 8 | 50 | 100 | 20 0 | 14 0 | 560 | 40 |

*Overcrowding.*—Considering the construction of these barracks, the regulation number of men is at least a third more than it ought to be.

*Ventilation.*—The only means of ventilation are by the end windows and some ventilating openings. But they are quite insufficient. A large shaft carried up through the middle of the length of each arch close to the piers, and above the roof, with large louvred inlets above the windows, in the manner shown in Plan XI., Figs. 1, 2, would improve the ventilation; but it is very questionable if such rooms would ever be well ventilated unless there was a gale blowing outside.

*Ablution and Bath Accommodation.*—The ablution room, bath, and wash-house are all in the same detached building. There are ledges for basins, one bath, and a boiler. The refuse water runs through a drain into a ditch, and is allowed to find a way for escape.

*Cook-house.*—There are three cook-houses, fitted with boilers and an oven. Water has to be carried from the pump. They are drained in the same manner as the ablution room.

*Latrines.*—These are of the usual Maltese construction. They are drained into a cesspit in the ditch, which is cleansed out when required.

*Drainage.*—There is none properly so called. The surface water runs off into the ditch, and is absorbed.

*Water Supply.*—There are two large tanks, from which the water is raised by pumps. It is stated to be of inferior quality, and only fit for washing.

*Officers' Quarters.*—These are partly in the main building and partly in a separate house. They are stated to be healthy.

These barracks are rarely occupied, and we do not think it necessary to advise the usual improvements to be fully carried out until the more urgent requirements have been fulfilled at the other barracks in the command. It will be sufficient in the meantime to provide for the ventilation of the rooms in the manner suggested.

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## 30.—Rabato Barracks.

These barracks consist of a few rooms, seldom occupied by troops, in the castle at Rabato, four miles distant from Fort Chambray. The castle crowns the summit of a commanding eminence overlooking the whole surrounding country, and must have been a grand place at one time, but it is falling rapidly into ruin. Much of it already is in a ruinous state; and there is a large angle of the works in such a condition that it may fall over the edge of the hill close to the town at any time. No repairs appear to have been undertaken since the island came into the hands of the British Government.

The barrack rooms and stores are in a better state than the other buildings, although they admit of improvement; but they are so connected with these buildings, that it is not worth while to spend money on them, unless it be considered advisable to execute such repairs as will preserve the castle itself from entire approaching ruin.

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## Description of Plans of proposed Military Hospitals at Malta.

### Hospital Sites.

Plan No. XXVIII. shows the nature of the sites of both hospitals. The general hospital site is within St. Michael's bastion, 169 feet above the quarantine harbour, and completely isolated from the houses of the town. Its area is about $2\frac{1}{4}$ acres, much too small if the hospital were in a town where it could be encroached on and surrounded by buildings, but as it overlooks all the country, the extent of ground, so far as ventilation is concerned, is indefinite. The site is on the highest ground within the lines, and freely exposed to all healthy winds, which at Malta blow from the north and north-west directions. There are no nuisances of any kind near it. The position is the reverse in every point affecting health to that occupied by the present general hospital, and no healthier one could be obtained in this part of the island.

The site proposed for the Cotonera hospital is close to the outer line of works at the southern side of the Cotonera lines, overlooking the open country. The position is entirely open and isolated from all houses. It is at a considerable height above the sea level, and, like the site of the proposed general hospital, is freely exposed to all healthy winds, although, from the extent of bare stony ground in the neighbourhood, it is not likely to be so cool.

The sites are the best which exist within the divisions of the fortress where the hospitals are intended to be placed.

### Plans of the General Hospital, Valetta.

Plans XXIX., XXX., and XXXI. show the proposed arrangement of parts in the general hospital. On plan No. XXIX. is shown the outline of St. Michael's bastion, the form and area of which have determined the entire plan. The pavilion construction which has been adopted in this case, in conformity with the recommendation of the Royal Commission on the sanitary state of the army, is so flexible that it has readily adapted itself to the necessities of the ground without any essential sacrifice of its special advantages. The area within the bastion is not large enough for a hospital for 300 sick, and it will be necessary to obtain possession of some houses where the front of the administration is to be placed. This being done the whole of the administrative part of the hospital will be kept separate from the sick wards, and thus the important principle in hospital construction of keeping the sick by themselves, and the administrative offices and quarters by themselves, will be realized.

There is some difference of level between the two ends of the ground, and it will be necessary to go some depth for a foundation. We propose to take advantage of this to obtain space, in light, airy, arched basements, some of them above the level of the ground for the pack store and for all the hospital stores, medical and purveying, required for this important station, and also for the orderlies' dining room, &c. The kitchen will be quite detached from the hospital on a lower level, and the diets will be raised to the different floors by a lift. All the ground floors will be on a level.

The sick wards are on two floors only, and the administrative block consists of two floors and a mezzanina.

The wards are in six pavilions, 50 feet apart. Each ward is 16 feet high, and, as the roofs are flat, the height of wall will be about 35 feet. The distance between the pavilions, 50 feet, would be too little for this height at home stations, but in such a climate as that of Malta, and in so exposed a situation as the building is intended to occupy, it will be sufficient for health. The plan shows that this element of distance has been determined by the form and area of the bastion.

These fixed conditions have also rendered it necessary to have the pavilions of different lengths, which is an advantage in so far as it enables wards of different sizes to be obtained.

The larger wards, exclusive of the space at the end, are intended to be 110 feet long by 28 feet broad, and to contain each 32 beds, which, with the height, 16 feet, will afford 1,540 cubic feet, and 96¼ square feet per bed.

On each side the ward entrances are placed a nurses' room and scullery, with small windows into the wards, and at the opposite extremity of the wards are the baths, lavatories, and water-closets, in separate projections, with ventilated lobbies and windows so arranged that in whatever way the wind may be blowing, any effluvia will be carried away from the wards. The compartments in which the water-closets are placed should be lined with glazed tile for the sake of cleanliness. Between these two end projections is an open space and a large window with a balcony overlooking the sea, where convalescents may find recreation and fresh air. There will be sufficient space for convalescents taking exercise in the sheltered areas of ground between the pavilions.

The operation theatre is on the upper floor of a detached pavilion, the ground floor of which is occupied by two single-bed wards to be appropriated to the care of noisy patients, and there are other two single-bed wards to meet any special emergency. The dead house and postmortem room are in arches under the north-east end of the corridor, quite away from the wards, and having their own entrance from the street outside.

All the pavilions are connected on both floors by an open arched corridor sufficient to afford shelter from sun and rain without interfering with the free circulation of air about the pavilions.

As already stated, the kitchen is outside the buildings altogether. No washhouse is required, as the hospital washing is all done by contract at a distance.

The administrative block is 35 feet from the ends of the wards, and there is a court 20 feet wide between it and the open arched corridor. It is connected for facility of administration by three separate stairs and passages with the hospital corridor.

On the ground floor are placed the porter's lodge and guard; the waiting room, surgeon's room, dispensary, quarters for the orderly medical officer, and for the captain of orderlies, the commandant's, purveyor's, paymaster's, registrar's, and captain of orderlies' offices.

In the mezzanina there are quarters for non-commissioned officers and orderlies, officers' servants, and kitchens.

On the upper floor at the north-eastern end are quarters for the superintendent of nurses and for female nurses, together with the clean linen stores and mending room, and in the south-western end are the commandant's quarters and a large day room for convalescents, with a non-commissioned officers' room attached to it for discipline.

Each division of the administrative building has its own separate means of communication with the hospital.

A large archway for carriages and ambulances is carried across the middle of the administrative block, and over the arch is the chapel, connected with the hospital corridors by stairs.

The area of ground is so limited that it has been impossible to find quarters for any officers except for those who must reside by regulation within the hospital precincts; these are the Commandant, the orderly medical officer, the captain of orderlies, dispenser, superintendent of nurses, together with non-commissioned officers and men of the army hospital corps. The required offices for all classes of officers are provided in the plan, but all the officers except those we have named will have to be quartered elsewhere.

We propose to introduce a very important improvement in the construction of both hospitals besides fire-proof flooring. A great disadvantage of the Malta building stone is its very porous character, absorbing rain in large quantity, especially if impelled against the walls by a strong wind. This gives rise to long continued dampness, which is very apt to penetrate to the interior of buildings. Besides this, the summer sun is so powerful that its heat penetrates walls of ordinary thickness, and all exposed buildings require verandahs to adapt them to the climate. This construction, besides its costliness, when applied to hospital buildings, tends to interfere injuriously with the internal ventilation, and with free external circulation of air. We propose to avoid both damp and heat by constructing the walls and roofs double, with a free passage for air between them, and to use properly constructed jalousies and shades for all windows exposed to the sun.

The necessary means of communication between the different parts of the building are all under cover.

The best material for flooring would probably be the hard Maltese limestone, well oiled and polished. The soft sandstone is unsuitable on account of dust, and it is doubtful whether wood flooring would not harbour vermin.

### Plan of Cotonera Hospital, No. XXXII.

This building is an adaptation of the pavilion construction to infantry regimental hospitals now being built on our plans for home stations. It consists of two end-to-end pavilions, similar to those of the general hospital, with the same arrangement of orderlies' rooms, sculleries, baths, and water-closets. It will afford the same amount of space per bed for sick. The hospital will be in two floors, and will accommodate 136 beds. There are four small wards, two on each floor, of two beds each for special cases. In the centre on the ground floor are placed the waiting room, surgery, hospital serjeant's quarter, and a room for orderlies. On the upper floor there is another orderlies' room and a day room for convalescents. The kitchen and stores are all in an outbuilding behind the hospital, so that there is nothing in the hospital proper except the sick and what is immediately required for their treatment and nursing. The front of the hospital is in the shade from its position, and the means of communication between the hospital and outbuildings are under cover. The walls and roof will be double, with ventilation between, as in the general hospital. The windows will be jalousied and shaded from the sun. The exercising ground for convalescents will have to be provided on the shady side of the buildings.

### Ventilation and Warming.

In both hospitals the windows will be carried up to within a foot or 18 inches of the ceiling, and the upper portion will open by a pulley and cord, so as to fall inwards like a louvre, and to throw any strong air currents up towards the ceiling. Swing doors, the upper panels of plate glass, for purposes of inspection, are required. Air shafts for removing vitiated air will be carried up in the spaces between the windows and from the corners of the wards to above the roof, and there louvred or otherwise protected to prevent rain beating in. The lower ends of the shafts within the wards will also be louvred, to throw any descending air currents up towards the ceiling. These shafts will be placed in each alternate space between the windows, and in the alternate spaces where there are no shafts there will be placed inlets for fresh air close to the ceilings.

The conjoined sectional areas of the shafts will be equal to one square inch for every 25 cubic feet in the upper floor wards, and one square inch for every 30 cubic feet of the lower floor wards. The conjoined area of all the fresh air inlets will be equal to one square inch for every 30 cubic feet of contents of the wards.

Every room, apartment, office, store, scullery, water-closet, ablution room, &c. within the hospitals should be ventilated in the same manner, and with the same proportionate areas of shafts and inlets. The kitchen will be as freely ventilated as may be re-

quired to keep it cool. Coolness is the only test of kitchen ventilation in Malta.

Although the climate of Malta has a high summer temperature, there are times in winter when fires are necessary for comfort. This is especially the case with sick and convalescents, and the existing hospitals are accordingly warmed by stoves. We would propose to continue this practice in the new hospitals, and to make use of a new stove for warming fresh air by surfaces of fire-brick for the purpose. This would be quite sufficient, because the use of these stoves would be only occasional, and they could be entirely removed in summer. Two such stoves for each of the larger wards and one for each smaller ward would be sufficient.

### Drainage, Water-closets, Latrines.

Every part of both hospitals will be drained to an outlet by glazed earthenware pipes. Each larger ward will have three water-closets of the best construction, and one water-closet sink. The syphons will all open into a vertical earthenware pipe, trapped at the lower end, where it is connected with the drain and open at the top, which will be carried above the roof of the buildings, and covered there by a grated box filled with charcoal. This arrangement will prevent the possibility of sewer gas entering the hospital, and any foul air escaping from the sewers will be discharged at the upper end of the pipe through the charcoal, which has the property of destroying all the organic matter the foul air may contain.

The orderlies' latrines should be outside the buildings, in such a position as not to be injurious. In outside latrines Macfarlane's or Jennings' apparatus would be the most suitable.

Each ward requires a water urinal in the same compartment as that in which the ablution table is placed.

The outlet pipes from the baths and ablution basins and from the sinks in sculleries will be discharged into a similar pipe trapped at its lower end where it enters the drain, and open at the top above the level of the roofs.

The ground immediately under the walls of the hospital should be carefully flagged and channelled, to convey the rain water speedily to trapped gulleys communicating with the general drainage of the buildings.

### Water Supply.

The water supply for the proposed general hospital would be most conveniently derived from the aqueduct. It would have to be raised to cisterns, from which it should be laid on at pressure to all the water-closets, sinks, baths, and lavatories. Hot and cold water should be laid on to the scullery sinks, and also to the baths and wash-hand basins.

Water for the Cotonera hospital might be obtained from another aqueduct at no great distance from it. It should be laid on hot and cold all over the buildings.

The roof water of both hospitals would be of considerable amount, and might be passed through filters into tanks for use.

### Ablution and Bath Accommodation.

Each large ward should have three ablution basins sunk in slate or marble slabs, with taps for warm and cold water. The baths should be of glazed terra cotta or of marble. The latter material is said to be the cheaper for such purposes in Malta.

### Hospital Kitchens.

The buildings should have plenty of light and ventilation. The best cooking ranges would be one of Benham's or Radley's, specially constructed for hospital cooking.

### Proposed General Military Hospital, Valetta.—Plans XXIX., XXX., XXXI.

*Reference.*

*Ground Floor:—*
- A. Wards for 32 beds.
- B. Ward for 16 beds.
- C. Ward for 8 beds.
- D. Small wards.
- E. Water-closets and ward sink.
- F. Lavatory, bath, and urinals.
- G. Nurses' room.
- H. Ward scullery.
- I. Corridor.
- J. Courts.
- K. Exercising grounds.
- L. Entrance gateway.
- M. Principal staircase.
- *a.* Purveyor, *b.* Paymaster } offices.
- *c.* Apothecary, *d.* Orderly medical officer } quarters.
- *e.* Clerk.
- *f.* Captain of orderlies quarter.
- *g.* Guard.
- *h.* Orderlies' stairs.
- *i.* Registrar.
- *j.* Dispenser.
- *k.* Porter.
- *l.* Governor's office.
- *m.* Waiting room.
- *n.* Surgeon.
- *o.* Water-closets and bath.
- *p.* Nurses' stairs.
- *q.* Lifts.

*Mezzanine Floor:—*
- *a.* Cook's room.
- *b.* Officers' kitchens.
- *c.* Commandant's stairs.
- *d.* Serjeant major.
- *e.* Officers' servants.
- *f.* Store.
- *g.* Bath.
- *h.* Lavatory.
- *i.* Serjeant.
- *j.* Orderlies.
- *l.* Orderlies' stairs.
- *o.* Water-closets and urinals.
- *p.* Nurses' stairs.
- *q.* Lifts.

*Upper Floor:—*
- A. Wards for 32 beds.
- B. Ward for 16 beds.
- C. Ward for 8 beds.
- D. Small ward.
- E. Water-closets and ward sink.
- F. Lavatory, bath, and urinal.
- G. Nurses' room.
- H. Ward scullery.
- I. Corridor.
- *a.* Convalescents.
- *b.* Commandant's quarters.
- *c.* Commandant's stairs.
- *d.* Chapel.
- *e.* Servant.
- *f.* Kitchen.
- *g.* Nurses (dormitories).
- *h.* Mending room.
- *i.* Linen nurse.
- *j.* Day room.
- *k.* Superintendent of nurses.
- *l.* Clean linen.
- *m.* Operating theatre.
- *o.* Water-closets, bath, and sink.
- *p.* Nurses' stairs.

### Proposed Hospital at Cotonera.—Plan XXXII.

*Reference.*

*Ground Floor:—*
- A. Ward for 32 beds.
- B. Ward for 2 beds.
- C. Nurses' room.
- D. Ward scullery.
- E. Bath, lavatory, and urinal.
- F. Water-closets.
- G. Water-closet and sink.
- H. Water-closet and urinal.
- I. Orderlies.
- J. Hospital serjeant.
- K. Waiting room.
- L. Surgery.
- M. Covered way.
- N. Kitchen.
- O. Scullery.
- P. Cook's room.
- Q. Medical comforts.
- R. Utensil store.
- S. Beer cellar.
- T. Larder.
- U. Orderlies' bath and lavatory.

*First Floor:—*
- A. Ward for 32 beds.
- B. Ward for 2 beds.
- C. Nurses' room.
- D. Ward scullery.
- E. Bath, lavatory, and urinal.
- F. Water-closets.
- G. Water-closet and sink.
- H. Water-closet and urinal.
- I. Orderlies.
- K. Day room.
- L. Bedding store.
- M. Clean linen store.
- N. Pack store.
- O. Assistant steward.

# PART IV.—BARRACKS AND HOSPITALS IN THE IONIAN ISLANDS.

Of the islands belonging to the Ionian Republic, the seven following contain the principal military stations:—

| | |
|---|---|
| Corfu, including Vido. | Cephalonia. |
| Paxo. | Zante. |
| Santa Maura. | Cerigo. |
| Ithaca. | |

With the exception of a few small out-stations, we have examined the barracks and hospitals in the first six islands. Cerigo is the only one which we did not inspect, because on examining the documents regarding it which were put into our hands at Corfu, we found that the barracks on the island admitted of no improvement, and that nothing short of entire rebuilding would render them habitable. Plans II. and VI., for erecting new barracks, including every necessary improvement, were prepared at the War Office and examined by us, before being authorized, and if carried out the small garrison at Cerigo would have the best barracks in the command. We shall, therefore, confine our report to the barracks and hospitals in the first six islands, beginning with Corfu.

## I.—CORFU AND VIDO.

### 1.—Topography and Climate of Corfu and Vido.

The island of Corfu is about 40 miles in length, by 17 miles in its greatest breadth. Its eastern side runs nearly parallel with the west coast of Albania, at a distance varying from about two miles to above seven miles. The whole of Albania, as seen from Corfu, presents a succession of lofty mountain ranges, intersected by valleys, exercising a material influence on the climate of the island, in summer and winter, according to the direction of the wind. The general aspect of Corfu itself is hilly, with bold ranges or single mountains rising to elevations of between 2,000 and 3,000 feet above the sea level. The hilly district of the island is its northern extremity. The south end is of much lower elevation, and has no protection from the sirocco winds, which are much felt during the season.

The geological structure, especially about the town of Corfu, consists of tertiary formations resting on secondary rocks, and all lower slopes and valleys are covered to some depth with loams and clays; capable of the highest cultivation, but chiefly covered with olives.

The town of Corfu is situated in latitude 39° 37′ N., longitude 19° 56′ E., on a peninsula, bounded on one side by Castrados bay, and on the other by Corfu harbour, which forms part of a deep bay running into the island for some miles west of the town. The island of Vido is in this bay, at the distance of a mile from Corfu and four miles from the coast of Albania.

The ground in the immediate vicinity of the town, as shown on Plan XXXIII., is undulating, and presents a number of detached eminences with valleys between them. The highest point is the top of the citadel, 231 feet above the sea. The eminence on which Upper Fort Neuf barrack is situated is 186 feet high. The average level of the town of Corfu is about 40 feet above the sea. Along the shallow margins of the bays at the foot of the heights there are considerable tracts of undrained malarious land. The most important of these are in the vicinity of Govino harbour at the upper end of the bay of Corfu, and 4½ miles from the town, the marshy ground at the mouth of Potamo river, two miles from the town, and the low ground at Manduchio and Castrados, within little more than half a mile. There is besides a large tract of salt marsh at the head of the salt water lake Calikiopulo, about a mile distant from the town.

The general character of the island is that of great productiveness, in which nature has done everything, and man little or nothing. While every country in Europe has been

improving its agriculture, Corfu appears to be at a standstill. The drainage in all the districts we visited is most defective, or rather there is none, and so the very first step for improving the general healthiness of the island and for increasing its produce has yet to be taken. Intermittent and remittent fever, as we shall presently show, prevail among the inhabitants in consequence of this and other sanitary neglects, and we met with numerous instances of well marked malarious aspect among the people in places which ought to be healthy. In no part of the island, within any distance of the garrison likely to influence the health of the troops is there any source of malaria which cannot be greatly diminished, if not rooted out. The natural means of drainage are ample, and even the low sea margins can be drained or filled in, as is being done at Cephalonia. There is nothing in the topographical features of the surrounding country which ought to be a source of ill health. All that is required is the intelligent application of means; but neglect of these means will infallibly produce disease in such a climate.

The island of Vido lies within the bay of Corfu. It is of an irregular angular form, a mile broad at one end, and tapering to a point at the other. Its length is about a mile and a half. The surface is hilly, and is formed by a ridge extending the length of the island, with spurs projecting from it at the broad end. The highest point is 137 feet 6 inches above the sea. The parade ground of the fort is 95 feet above the same level. The nearest marshy ground is at the mouth of the Potamo, three miles distant to the west. Its extent is about 120 acres. There is marshy land in one of the bays of the Albanian coast at a considerably greater distance, but there is no satisfactory evidence that this affects the health of the troops in garrison. It was stated to us that in one house situated in a narrow valley below the level of the fort remittent fever had appeared, but the site occupied by the house is sufficient to account for this occurrence.

The underlying rock is limestone, covered by a thin stratum of soil, which is said to become almost glutinous in wet weather but is hard in dry weather. There is no cultivation, very few trees, and no shade. Under vegetation is extremely abundant and active in spring, when heavy dews fall. The large amount of decomposing vegetable matter produced by it is not conducive to health, but lately this has been burnt in summer with salutary effect.

Being surrounded by the sea, and exposed to all winds, there is a free external circulation of air. The wind is sometimes very violent during the winter months, and when wind is accompanied by rain, wet and damp become very penetrating. Some new brick huts lately erected have had the rain driven through the bricks so as to wet the interior.

The climate generally of Vido is the same as that of Corfu about to be described, except that the cooling influences of cold winds and sea breezes are more felt. Hence there is perhaps greater variability, exercising greater influence on diseases of the chest and on rheumatism.

There is no population on the island except the garrison and that connected with it, about 700 persons in all.

*Climate.*—The elements of the climate of Corfu, so far as we have been able to obtain them, are given in Appendix No. 1 for five years, 1855 to 1860. They show very hot summers with mild winters, and considerable variability.

The mean monthly maxima of temperature for June, July, and August are 86°·7, 93°·9, and 93°·1. The mean monthly minima for December, January, and February are 46°·8, 43°·6, and 48°·6. The summer temperature may be said to vary between 70° and 94° nearly, and the winter temperature between 43½° and 74½°. The mean monthly variation is highest in December, when it amounts to 20°·1, and lowest in February, when it is 12°·5. Although the heat is tempered by cool northern winds, the climate is somewhat extreme, and the variations are often sudden, requiring care in clothing and exposure. During hot weather, light loose clothing is requisite in this, as in all the islands, with flannel next the skin, and the want of such a change in dress has often been seriously experienced.

The rainfall, as given in the table, is above 51 inches per annum.

As regards its influence on health, the climate is considered very favourable from October till May, after which period it becomes hot and very oppressive, especially during the sirocco. It is then considered debilitating, producing a sensation of burning heat and oppression of the chest, accompanied with languor and a propensity to perspire on the slightest exertion. But in this as in similar cases where the sensible effects of climate are sure to be observed, and the influence of local causes, called into activity by the increased heat and moisture, are almost as certain to be overlooked, it is not easy to say what kind and extent of influence is really exercised by the simple elements of heat, moisture, and variability, *per se*. It is quite certain that in the present neglected state of the drainage and cultivation of the island of Corfu, more especially

of that part of it about the town, and in the neglected state of the town itself, there are elements of unhealthiness sufficient to account for any local diseases which may show themselves, quite independently of climate. Under the influence of high temperature, moisture, and variability, local conditions become of far more importance than they are in such a climate as that of England; but the fact is by no means sufficiently recognized, either at Corfu or in any other of these islands.

## 2.—Mortality and Diseases of the Native Population.

The Table, Appendix No. 2, gives the mortality and fatal diseases among the population of the town and suburbs of Corfu for six years, from January 1st, 1855, to December 31st, 1860.

The population amounts to 26,012, distributed as follows:—

| — | Males. | Females. |
|---|---|---|
| Town - - - | 9,245 | 8,454 |
| Suburbs - - - | 4,501 | 3,812 |
| Total - - | 13,746 | 12,266 |

The average mortality among the same population during three years was 474 males and 401 females, including an annual average of 36 premature and still births, which being deducted would leave 839 as the mortality from disease and old age. This mortality includes its proportion of the cholera epidemic of 1855, which cut off 448 of the population in that year: but the epidemic may be fairly reckoned as due to bad sanitary conditions, and ought to be included in the legitimate mortality of the population. During these six years the average annual death-rate was 32·2 per 1,000, (or, excluding the cholera, about 30 per 1,000,) a rate indicating a high degree of local unhealthiness among so small a population.

On examining the causes of death, we find tubercular diseases, such as consumption, mesenteric disease, scrofula, atrophy, &c., occasioning upwards of 28 per cent. of the mortality. The zymotic class, including fevers, diarrhœa, dysentery, cholera, &c., occasion about 16 per cent., and diseases of the chest, including consumption, about 24 per cent. of the mortality.

There are several omissions in the return which lead to doubts as to the state of registration of deaths in the island. Thus there are in these six years no deaths reported from small-pox, scarlet fever, or measles, while the troops in garrison have certainly not enjoyed a similar exemption from this class of diseases.

In order to ascertain the nature of the more prevalent diseases, we obtained the return, Appendix No. 3, showing the admissions, deaths, and diseases, in the Civil Hospital, Corfu, during a period of six years, 1855–60.

This table shows that chest diseases afforded 16 per cent. of the admissions, and 29 per cent. of the total deaths. One-half the mortality from chest diseases was attributable to consumption. Fevers of various types give upwards of 15 per cent of the admissions; not a very large proportion; and 7½ per cent. of the mortality, one-half of the fever mortality being due to typhoid fever. The table also shows the nature of the local fevers. It shows that out of 464 admissions from fever, 214 were due to intermittent, nine of the cases being "pernicious." Twenty were due to typhoid fever, of which 12 terminated fatally. There were eight cases of adynamic fever, of which five died. There were 174 admissions from rheumatic fever.

By making use of the data afforded by the mortality and hospital returns, we learn that the most important diseases among the native population are tubercular diseases, fevers, and bowel affections. It is impossible to say how far tubercular degeneration may or may not influence chest and abdominal diseases generally; but from the extent to which a deteriorated state of constitution exists among the population, as shown by these returns, it is not at all improbable that many cases of diseases of the chest and abdomen are more or less the result of tubercular disease. There is enough, however, in the changeable character of the climate, at certain seasons, to account for much of the acute chest and rheumatic disease existing. But we must look elsewhere for the causes of that generally deteriorated stamina, the existence of which among the population is indicated by the statistics.

We next proceed to give a brief sketch of the sanitary condition of the town and neighbourhood, to which the mortality table refers.

### 3.—Sanitary Condition of Corfu.

We have already referred to the general neglect of anything like agricultural drainage as likely to influence the public health in such a climate; but when we examine the condition of the town and neighbourhood, by which the health of the garrison is likely to be more affected than by the state of the country, we find a condition of things in comparison with which the absence of agricultural drainage is a very small matter indeed.

Never, in the whole course of an extended experience, have we met with any places so thoroughly neglected as the town of Corfu and its adjoining villages. To come upon them, as we did, from Malta, was like retrograding centuries in civilization. Malta, as we have shown, is by no means all that it ought to be, and will be, but the worst spots of Malta are better than the best spots in Corfu, excepting only the newer portion of the town, close to the esplanade.

The town covers the ridge of ground between Corfu harbour and Castrados bay. It is irregularly built, and its houses appear to belong mainly to the time of the Venetian possession. Except one or two newer streets, all the densely peopled part of the town consists of narrow alleys, with a few wider streets among them, running in various directions, without order, and not admitting of free ventilation. The ground on which the houses are built is on different levels, falling generally towards the harbour, in the neighbourhood of the Custom House, where much of the drainage of the higher levels is concentrated. Except a small area in this locality, the levels would admit of the freest fall for drainage. Indeed, along the whole northern face of the town towards the harbour there is a vertical precipice 40 to 50 feet in height, above the level of which the town is built. The fall on the south side towards Castrados bay is perhaps greater, though more gradual. Any way the fall is much more than is required for the most efficient drainage. So far, then, as concerns local position, this town might, under enlightened municipal administration, become one of the healthiest and finest in the Levant, worthy of being the capital of one of the most beautiful and fertile of the Mediterranean islands. At present it is the reverse of all this. No doubt, in Corfu as in every other place under the sun, there are difficulties in the way of improvement; but they are not a whit greater than have to be met elsewhere. There is an old, irregularly built, and in many parts a badly built town to be opened up and reconstructed. There are old houses of a bad, close, unventilated construction, overcrowded with people, and most of those we saw in a very filthy condition, without any of those domestic conveniences which have been long in use in other parts of Europe, and obviously under no efficient sanitary superintendence or regulation. The atmosphere almost everywhere foul and offensive. The street cleaning, as we saw it, was carelessly and badly done, the paving and guttering generally inferior, and often irregular and very bad. Gutters, where they did exist, sometimes having cesspool matter lying in them opposite the doors and windows of houses. The drainage as bad as possible, and in most streets making things worse than they would otherwise have been. There may be some excuse for not opening up new streets, but in the midst of such natural prosperity as the island of Corfu presents, there can be no excuse for such neglects as we have barely indicated, except ignorance of how these things degrade the health, morals, and productive power of the population.

All this is well understood elsewhere, and we have spoken strongly about it in the hope of inducing those persons who have undertaken municipal duties to inquire what their responsibilities towards their poorer fellow citizens really are, with the view of acquitting themselves of them.

Beyond the limits of the town, but sufficiently near to affect the purity of the air in certain seasons and winds, is the low, undrained, filthy village of Manduchio, lying immediately west of Fort Abraham. Still further in the same direction is the low, undrained land at the mouth of the Potamo, already mentioned. On the south side of the town is the village of Castrados, built on a swampy sea margin, without drainage, and in most parts extremely filthy. The large extent of salt marsh, already mentioned, at the head of the lake of Calikiopulo, also affects the health of the district in its neighbourhood. These very obvious sources of ill health are all remediable or removable. It is a mere matter of very ordinary sanitary engineering, presenting no unusual difficulties, and the cost of which would be far more than repaid in improved health and improved value of land and other property.

*Town Drainage.*—So far as we could ascertain, the drainage is chiefly on the surface, and there are few efficient main sewers. In the villages the drainage is by foul open ditches. There is no house drainage and few or no waterclosets, except in houses

frequented by people from England. The usual practice appears to be to throw the excreta into the streets or gutters, or to have some sort of bad, unwholesome privy communicating with an open drain within the house, often in the kitchen, into which all slops are thrown. Many people resort to the out-skirts of the town, and the air is infected by this abominable uncivilized habit.

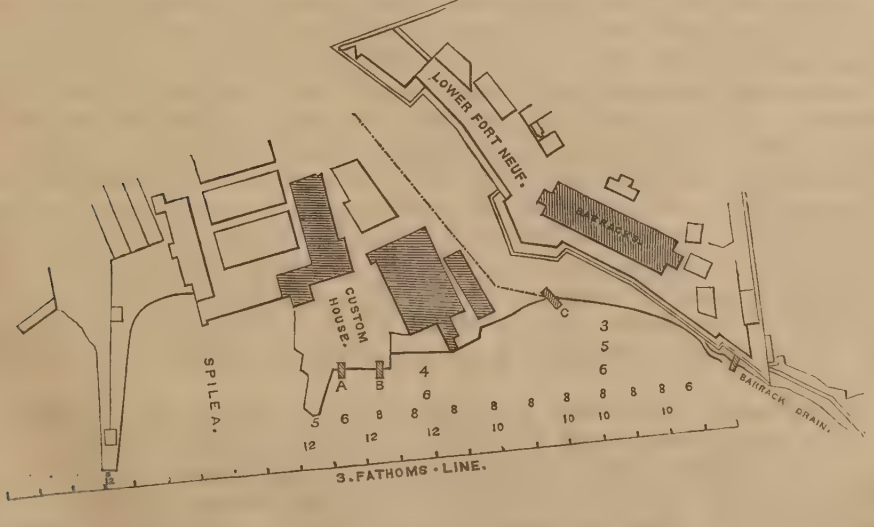
The Central Commission of Health, as will be seen by their Report, Appendix 4, had their attention called to the state of the drainage by the inhabitants of Manduchio, on account of the numerous miasmatic cases of disease by which the village was infested. This memorial led to an inquiry into the general state of the drainage of the town and suburb, by direction of the Lord High Commissioner; and the Report, dated the 27th September 1860, states briefly the nature of the defects and the class of remedies suggested. The practical result of their inquiry is, that a proper system of drainage, both public and private, for the town and suburbs, as well as for the houses, is a matter of urgent necessity, and ought to be carried out without loss of time, but nothing has been done. It would certainly be better to do nothing except to secure a good surface drainage and a proper system of cleansing than to construct sewers or drains similar to those which have been laid down in times past. They are opposed to every sound principle of construction, and they are dangerous to public health.

What is really required is, that a survey be made by a competent sanitary engineer, and a plan and estimate for a complete system of sewerage and house drainage prepared, and on that plan and estimate the work should be proceeded with and completed as speedily as possible. The chief difficulty would be in providing suitable domestic conveniences, in consequence of the prevalence of uncivilized habits among the population; but no doubt this difficulty could be overcome. At all events, there is abundant choice of contrivances in use in England suited to every condition of life. None of them are costly, and, with a little attention, all are effective, according to their construction. They have been brought successfully into use under circumstances as unfavourable as any which exist at Corfu.

The execution of these sanitary works will require time, but there is one work of immediate importance to the health of the troops as well as to the health of the population near the Custom House, which should in some way or other be at once attended to, and that is the condition of the drainage outlets at the Custom House wharf. We have already stated, that the vicinity of this wharf, being close to the sea level, the town drainage gravitates towards it, and is there discharged by three outlets into a small bay about 200 yards across, and from 80 to 100 feet wide, lying between the end of the Custom House quay and the rock to the west of Lower Fort Neuf barracks. The outline of the ground and position of the sewer outlets are shown in Fig. 22, as well as the depth of water into which the sewage is discharged.

The letters A, B, C, and the outlet marked "barrack drain" show the position of the sewer mouths. The figures within the three fathom line show the depths of the water in feet as ascertained on special survey.

Figure 22.—Sewer Outlets into Shallow Water at Lower Fort Neuf.




It will be seen that the drains open into an expanse of still, tideless seawater, from three to four feet only in depth. The temperature both of the air and water is high, and

decomposition proceeds very energetically; besides which, the bottom is covered with sewer deposit, constantly giving off foul gases, and whenever boats pass through the shallow water, which they do every minute of the day, the mud is stirred up and gives off the most offensive odours. We have ourselves had experience enough of the great nuisance in passing through this belt of water. The smell from it pervades the whole neighbourhood, occasioning attacks of illness among officials and others employed along the shore. At times the effluvia pervade Lower Fort Neuf barracks, which directly overlook the nuisance, and we have no doubt that the liability to fever among the troops occupying these barracks is partly to be attributed to this circumstance. Apart from injury to health, the nuisance is so great at times that it is not right that either officers or men should be exposed to it; and if it really were impracticable to remedy this mischief, we should have no hesitation in recommending that the barrack be abandoned. But this is not required. The evil could be easily remedied by carrying the outlets, either separately or conjoined, into deep water.

The plan shows that there are three fathoms water at about 150 feet from the outlets, clear of the end of the quays, into which the sewage could be carried by means of iron pipes at a very trifling cost in comparison to the advantage which would follow from the work.

Connected with this same nuisance is the state of the foreshore, on which all kinds of putrid matter is washed up and left to decompose in the sun.

This can only be remedied by running a quay along it, in deep water, a work which would reclaim some valuable land and quay space, where it is much required, out of a surface of shore and water which is at present an intolerable nuisance. If this were done, improvements in the sewer outlets could be carried out at the same time.

So urgent do we consider this work for the health of the troops in lower Fort Neuf barracks, that should any difficulties arise with the authorities as to the cost of the work, we would recommend that the War Office should at once execute it out of the War Office funds, and ask for the repayment of one-half the cost from the town.

*Surface Drainage, Paving, and Cleansing.*—These sanitary works are in a rude state in many parts of the town. The surface is uneven or broken, and the channelling not sufficient for carrying off the water rapidly. Hence, also, the cleansing is by no means good. The paving is better than it is in some other Levant towns, but not at all to be compared to the paving of Valletta. It is not sufficient for health. In improving the paving, properly squared stones should be used, and the joints should be laid very close, the water channels should be formed with great care, and all courts and passages should be flagged.

*Water Supply.*—While expressing freely our opinion on the sanitary neglects presented by the town, we are glad to find one thing of which, up to a certain point at least, we can approve, and that is the water supply. The approval must, however, be limited to the fact that a considerable supply of water has been brought a distance of seven miles in pipes and conduits, and distributed more or less satisfactorily to the houses. The work was undertaken at the instance of Lord High Commissioner Adam, and was executed for the municipality and garrison, under the superintendence of the present Surveyor to the War Department, Mr. Mennie. It would have been amply sufficient for all purposes had the purity of the sources from which the water is drawn been equal in efficiency to the engineering skill displayed in the design, and had the local authorities connected their water supply with a proper system of house and street drainage. At the time the scheme was proposed less attention was bestowed on water sources than is now the case, and springs were selected without any sufficient analysis or inquiry into the sources of the water. The first intimation which was received of any fault in the water was the partial blocking up of the pipes by corrosion of the iron, and by deposit of crystallized carbonate of lime in the leaden branches. These occurrences led to an inquiry, only now completed, and which has shown the danger of selecting water for towns without a careful preliminary analysis.

The history of the water supply, so far as it is necessary for our purpose, is contained in Appendix 5, which also gives a chemical account of it from Mr. Abel, Woolwich.

Part of the water issues from the springs of St. Nicolo, and is collected into a stream, which, after driving eight flour mills and getting much fouled in its progress through them, is joined by another stream from the reservoir of Carteri, which is supplied by a spring. The conjoined waters then pass through a filter to a brick barrel drain, conveying the water to another filter, through which it is passed into the reservoir of Perama, and thence by two lines of 9-inch iron pipe, one for the higher and the other for the lower districts of the town.

As already stated, the obstructions in the pipes led, for the first time, to a proper analysis being made by Mr. Abel, and the following are the contents per imperial gallon:—

| — | I. San Nicolo Water taken at its source at the Junction of all the small Springs. | II. San Nicolo Water after its passage through eight miles. | III. Water of the Spring of Carteri. | IV. Water of the United Springs of Carteri and San Nicolo in the state it falls into the Reservoir at Parama. |
|---|---|---|---|---|
| | grs. | grs. | grs. | grs. |
| Carbonate of lime - - | 12·99 | 12·60 | 16·52 | 14·00 |
| „ magnesia - | 3·02 | 2·20 | 1·79 | 1·53 |
| Sulphate of lime - - | 6·85 | 6·66 | 13·33 | 8·96 |
| „ magnesia - - | 3·68 | 2·85 | 8·39 | 6·80 |
| Chloride of sodium - - | 1·37 | 1·25 | 1·99 | 1·48 |
| Oxide of iron and alumina - | 0·42 | 0·30 | — | trace |
| Organic matter - - | 2·24 | 2·00 | 2·38 | 1·80 |
| Total solid constituents, (direct estimation) - | 30·58 | 29·96 | 44·40 | 34·80 |

This analysis shows that all the waters are bad and hard, to such an extent as to partake of the character of mineral waters. The amount of carbonates, apart from the sulphates, would alone constitute these waters very expensive for use, merely from the waste of soap and linen in washing.

The sulphates vary from 9½ grains to nearly 22 grains per gallon, being from three to seven times the amount which has led (in the case of Liverpool) to the rejection of waters of this class for town use. The inevitable result in the present case is obstruction of water pipes, increased cost for washing and for wearing apparel, and imperfect cooking, for sulphates harden all tissues, animal and vegetable, boiled in them. They are likewise injurious to digestion. The San Nicolo water is stated to be so dirty for eight months of the year that it is not used; and during the whole of that period the Carteri water, with nearly 22 grains of sulphates per gallon, is had recourse to.

The best thing to do under the circumstances would be to make a fresh survey of all the water sources near which the aqueduct passes, to have these sources carefully examined and their waters analyzed. The best sources should be selected and substituted for the present springs. The Carteri spring should be the first rejected, because it is the worst, and afterwards the San Nicolo springs. The cost of a few miles of additional piping, if necessary, to effect the change, is nothing when compared with the advantages of obtaining softer and better water. In all probability there is a deposit of gypsum in the strata whence the water comes.

If no better water can be obtained, it would certainly be worth while to introduce Dr. Clark's softening process by means of lime, as suggested by Mr. Abel. This would diminish, but it would by no means remedy the evil. The process is very simple but it should be entrusted to competent hands.

The quantity of water varies with the season, but the mean is given in the Report, Appendix 4, at 324, 250 gallons per day, which would afford 7 gallons per head a day to above 46,000 people. The supply is therefore ample as to quantity.

The distribution is effected by iron branch pipes of from two to four inches in diameter, and by three-quarter inch leaden pipes, by which the water is carried to the consumers. The total number of water taps in the town and suburbs, both for public and private use, including 100 for the troops in the Citadel, is 1,382.

The question as regards water supply may be summed up as follows:—

1. The method of collecting and bringing the water to the town is correct in principle and well carried out.

2. Although partly laid on to the houses for ordinary use, the water supply is not turned to proper account for waterclosets or other improved domestic appliances, nor for cleanliness.

3. There is no proper connexion between the water supply and drainage either public or private, and were the water ever so unexceptionable, it would, in the absence of proper house and street drainage, only amount to half of a sanitary improvement. Works of water supply and drainage should always be planned in relation to each other and carried out together.

4. The quality of the water is so inferior as to render improved sources of water supply necessary.

*Nuisances.*—Nuisances abound in all directions both in the town of Corfu and in the villages and suburbs. Even the sea is not kept free of them, for the public and commissariat slaughter-houses are placed on its margin between Fort Neuf and Fort Abraham, and all the blood and offal are poured into tideless shallow salt water under a hot sun, where the putrid matter remains, or is deposited on the neighbouring shores, until it is decomposed away, producing the most abominable nuisance wherever it reaches. There is no excuse for this. The whole of the matter should be put to some useful purpose, but if this is not done, it can at least be put into a boat and discharged into deep water a mile from the shore, where it would harm no one.

The other nuisances referred to are connected with imperfect cleansing, bad drainage, open putrid gutters and similar sources of impurity, not one of which would be permitted to exist under an efficient municipal administration. They are all so many indications of the absence of proper care for the public health, the results of which are visible in the mortality statistics and in diseases prevailing among the poorer classes of the population.

*The Civil Hospital* is on an eminence outside the town in front of the prison. It is a large building originally intended as a residence and converted into a hospital. The rooms are spacious, lofty, and well lighted, and afford good accommodation for the sick. The building is wanting in many details and conveniences, but it is nevertheless by far the best civil hospital in the Ionian islands, and could be made sufficient for its purpose so far as the construction would admit, at no great outlay.

The brief sketch given above shows that the sanitary defects existing in Corfu are the same as those found in other imperfectly civilized communities. They are the same in character though in some respects worse in degree than are found to exist in the Levant towns generally. All of them are removable, and would very soon disappear under an improved system of agriculture, and under a better municipal government.

What the people require is a proper sanitary administration, embodying powers similar to those in the English Public Health Act. As already stated, a drainage survey should be made of the town by a competent sanitary engineer, and a complete system of sewerage, drainage, and water supply on the most approved modern principles should be carried out. Every house should be drained and supplied with water and with proper civilized domestic conveniences. The villages should be similarly improved, unwholesome open ditches should be replaced by sewers and drains, and proper roads made.

Better paving and channelling is required for the public streets, and all courts should be flagged, channelled, and drained. Public cleansing should be better organized and made more effectual, and filth should be removed out of the town at least once a day. The same system of cleansing should be extended over the neighbouring villages and open spaces, and all nuisance prevented.

Better water should also be obtained for the town. Under a wise municipal administration the town would be opened up and bad close streets and courts removed. More house accommodation and of a better character would be provided; existing houses of the poorer classes would be cleansed, lime-washed, and made wholesome. A market similar to the new one at Valetta would be provided, to replace the present very inferior market.

Agricultural drainage and the drainage of marshes and marshy ground would form no unimportant part of municipal duty, either in the way of direct execution or of encouragement.

As Corfu is a garrison town, everything that can in any way bear on the health of the troops should be under the inspection of a garrison sanitary officer in terms of the new medical regulations.

If these things were done Corfu would be a very different place from what it is. But it depends on the people themselves to wipe off the stigma attaching to their beautiful island of being unhealthy as well as beautiful, and of being at the same time one of the spots of the East most favoured by nature and most neglected by man.

## II.—SANITARY STATE OF THE GARRISON.

### 1.—Sickness and Mortality among the Troops.

The statistical reports on sickness and mortality in the army give the death rate among troops serving in Corfu and Vido for two separate periods.

1st. For 20 years intervening between 1817 and 1836, during which the mortality varied in different years from 12 to 35 per 1,000 per annum, the average for the whole period being 20 per 1,000 per annum. The average strength of the garrison during the period was 2,219. Of the total mortality 9 per 1,000 was due to fevers, 4·8 per 1,000 to pulmonary diseases, and 3 per 1,000 to diseases of the bowels. These three classes occasioned a mortality of 16·8 per 1,000, that is, they were the cause of four out of every five deaths.

The total mortality from fever amounted to 395 deaths, of which 29 were caused by intermittent, 251 by remittent, 109 by continued, and 6 by typhus fevers. Remittent and intermittent occasioned 7 out of every 10 deaths from fever.

The most important chest disease was phthisis, from which there were 129 deaths ; to these may be added seven deaths from the cognate disease hæmoptysis, and seven from chronic catarrh, making the consumption mortality 143, out of a total mortality of 212 from lung diseases, or two out of every three deaths. The next most important chest disease was pneumonia, which was the cause of 57 deaths.

There were 136 deaths from bowel diseases, of which 102 were due to dysentery.

During these 20 years the diseases causing the greatest loss to the garrison were remittent fever, continued fever, consumption, and dysentery. There arose from these four diseases 591 deaths, out of a total mortality of 891, or 66 per cent. of the total deaths.

2. The second period given in the statistical reports is the 10 years from 1837 to 1846. The average strength of the garrison during this period was 1,696. The annual deaths varied from 10·1 to 23·5 per 1,000, the average for the 10 years being 15·8 per 1,000.

Of this mortality 4·5 arose from fevers, 6·1 from chest affections, and 1·5 from bowel diseases.

As compared with the first 20 years there had been a large reduction in the mortality, especially in that from fevers, which had fallen to one-half; but the admissions showed the same types of fever as during the preceding period.

Intermittent gave 28·9 admissions per 1,000 strength, remittent 12·2, and continued fever the very high proportion of 161·9 per 1,000 strength.

During these 10 years it is worthy of remark that while the strength of the garrison had been reduced, the barrack accommodation had been extended, and overcrowding materially diminished.

A return, Appendix 6, has been made up for us by the medical officer in charge, showing the diseases and mortality for the years from 1850 to 1860. The mortality apparently fell to 12·6 per 1,000 during this period, but as it includes the time of the Russian war, there may be disturbing influences to render it not a fair account of the case. The most important point shown in the return is the proportionate mortality from different diseases. It will be seen that during the 10 years in question fevers occasioned 30 per cent. of the deaths, and that 76 per cent. of the fever deaths were due to typhoid and continued fevers. Pulmonary diseases occasioned very nearly the same amount of mortality as fevers, and more than half of this mortality was due to consumption.

For the year 1859, the first year included in the annual report of the Army Medical Department, the facts are given more in detail. This report gives the strength of the garrison at 2,663, and the mortality at 15·37 per 1,000 strength, higher than the average of the 10 years in Table 6. The fever deaths had risen to 9·01 per 1,000, which was the average of the first 20 years. There were very few admissions, and not a single death from intermittent and remittent; the whole fever mortality arose from continued and typhoid fevers, of which 423 cases were received into hospital. Attention was called to this increase of fever by Deputy Inspector-General Beatson in his report for 1859, in which he points out the great danger to the health of the troops from the unwholesome state of the neighbourhood of certain barracks.

The year 1860 was a more healthy year. It appears from a return prepared for us by Deputy Inspector-General Innes, that there were 19 deaths during the year,

of which eight were from chest diseases, including two from consumption, two deaths from remittent, and three from continued fevers.

On arriving at Corfu at the end of October 1861, it was stated to us that there had been a considerable increase of the admissions from fever since the beginning of the year, and to show this and the nature of the diseases, Dr. Innes was kind enough to prepare returns, Appendix 7 and 8, including the Corfu barracks separately, and also those of the other islands.

One return, Appendix 8, gives the following results for 10 months ending October 31, 1861 :—

| Barracks. | Average Strength. | Total Fever Cases. | |
|---|---|---|---|
| | | Admitted. | Died. |
| Venetian - - | 862 | 135 | 9 |
| Bomb-proof - - | 728 | 132 | 5 |
| Lower Fort Neuf - | 336 | 100 | 4 |
| Upper „ - | 211 | 33 | 2 |
| Tents, „ - | 66 | 53 | 2 |
| Huts, „ - | 54 | 24 | — |
| Fort Abraham - - | 146 | 46 | — |
| Vido barracks - - | 374 | 17 | 1 |
| Tents and huts, Vido - | 140 | 10 | 2 |
| Lazzaretto - - | 4 | 1 | 1 |
| Total - - | 2,921 | 551 | 26 |

According to this table, the average strength at Corfu and Vido for the period was 2,921, out of which there had been 26 fever deaths.

The nature of the fever cases for the first nine months of the year is given in Appendix, No. 7.

From which it appears that out of 517 fever cases 40 were intermittent, 53 remittent, 9 typhoid, 1 typhus, and no less than 414 of the continued type.

The total mortality for the same nine months was 32, of which 3 deaths were from remittent, 8 from typhoid, and 11 from continued fevers: affording a fever mortality of 22, or 66 per cent. of the total deaths.

The same table shows that during the same periods of time the admissions per 1,000 strength from fevers alone were 263 in Fort Neuf as compared with 143 in the Citadel, and the fever mortality was in the annual ratio of 11·5 per 1,000 in Fort Neuf, and a little more than 9·4 in the Citadel. A more remarkable circumstance is presented by the difference in the types of fever. It appears that attacks of intermittent and remittent were upwards of eight-fold more numerous in proportion to strength among the troops in the Citadel than in Fort Neuf, while fevers of the continued and typhoid type were $2\frac{1}{2}$ times more numerous in Fort Neuf than in the Citadel.

These facts regarding the mortality and the types of fever in Fort Neuf and the Citadel are important when compared with the other facts as to the unfavourable sanitary condition of the vicinity of Fort Neuf already alluded to.

A return for the barracks in Vido is given in Table 8, but the troops there are chiefly detachments for rifle practice, and few remain for any length of time on the island. In former years the general opinion of medical officers was that most of the fever cases in Corfu were contracted in Vido, although this was never distinctly shown.

The only body of men whose residence in the island has been sufficiently long to bring them under its local influence as to health are the military prisoners, and with the view of obtaining some estimate of the healthiness of the island, we called for a return of admissions to hospital among prisoners for a period of 12 years (Appendix 9), which certainly does not prove the island to be specially unhealthy.

The return shows that out of a daily average strength of 33 prisoners there were in 12 years 242 admissions, being in the ratio of 611 per 1,000 per annum, while the admissions from fever were only 18 per cent. of the total admissions.

This greater healthiness may be due to the fact that although the prison cells are not all that could be desired, they are better ventilated and much less overcrowded than the barracks at Vido, and altogether the accommodation is better.

The barracks if occupied for any length of time by troops, especially if crowded, would be very likely indeed to yield a considerable amount of fever, for reasons stated in the sequel.

### 2.—Sanitary Condition of Barracks.

The whole of the evidence before us shows that fever is the most important element in the health of the garrison at Corfu, and after fevers chest affections. The basis of the more severe forms of fever is malaria, partly the result of the backward state of agriculture and of drainage, and partly the result of the abominable condition of the localities among which certain barracks are placed, but also, as we shall presently show, of errors in the position and construction of barracks, aggravated by great overcrowding, want of ventilation, defects in drainage, &c.

### 3.—Sites of Barracks.

The following is a list of the barracks and hospitals in Corfu and Vido,—

| *Citadel.* | *Fort Abraham.* |
|---|---|
| Venetian barrack { A. barrack, royal artillery. B. barrack, infantry. | Old barracks. |
| Bomb-proof barracks. | *Vido.* |
| Garrison Hospital. | Fort George. |
| *Fort Neuf.* | Hospital room. |
| Upper Fort Neuf barracks. | Lunette barracks. |
| Lower Fort Neuf barracks. | Maitland Tower. |

With the exception of Upper Fort Neuf barrack, the old barrack room in Fort Abraham, and Maitland Tower, accommodating in all about 244 men, none of the barracks in this list occupy good healthy positions; all except the three small barracks we have here mentioned have their ventilation more or less interfered with by high scarped rocks, or by high surrounding walls. Defence more than health has dictated their position.

The Citadel, within which the most important barracks and the garrison hospital are situated, occupies the summit and sides of a narrow rocky peninsula, projecting into the bay to the east of the town of Corfu, from which it is separated by the esplanade.

Its extreme length is less than half a mile, and its breadth is about 250 yards. The surface is merely that of an irregular rock with two summits, the loftiest of which rises 231 feet above the sea level. This is separated from a lower summit by a narrow neck of ground 115 feet above the sea, affording a site for the hospital. Surfaces on which to build barracks or other buildings, as well as for esplanades, have been chiefly formed by levelling and cutting away the rock, and nearly every available spot is occupied in one of these ways.

The Venetian barrack is on a terrace facing the north, and overlooking the sea at an elevation of about 40 feet above it. But immediately behind it are the "long rooms" as they are called, built literally against the scarped rock, which rises far above the barracks and cuts off all external movement of the air on the south side. The natural fall for the drainage of the rock is directly towards the barracks, which are built across the line of the fall. This is always unfavourable to health in districts subject to malaria. The sea immediately below the barrack is shallow, stagnated by the small yacht harbour, the "mandracchio," and as a large part of the Citadel drainage has its outlet into the shallow water close under the barracks, there is much nuisance experienced from its decomposition in certain states of the wind.

The Hospital occupies a good site, except that the south winds have been cut off from the wards by a building erected between the hospital and the sea. Before this was done the wards had the benefit of winds both from north and south.

The Bomb-proof Barracks face east and west. On the east side the rock fronts them at a short distance, and on the west side they are enclosed by the defences, between which and the barracks there is a range of workshops, &c. The site is about 40 feet above the sea level, but these barracks do not receive the full benefit of the sea breezes.

Upper Fort Neuf Barrack crowns a rocky eminence 182 feet above the sea. Its position is good, and ought to be comparatively healthy, except that it is exposed to the winds blowing over the filthy town below it.

Lower Fort Neuf Barrack is very unfavourably placed; for although built on a terrace of rock 26 feet above the sea, and overlooking it, the back wall of the building is within

a few feet only of the lofty scarped rock, rising 150 feet above its foundations. This great wall completely excludes ventilation on that side, and, as in the case of the Venetian barrack, the line of building is constructed across the natural outfall for the drainage. As already mentioned, the great defect in its position is the state of the town drainage outlets and the condition of the foreshore. Altogether, this barrack occupies the most unhealthy site within the garrison, and sends numerous fever cases to hospital.

While we were at Corfu considerable uneasiness prevailed on account of the amount of fever which had shown itself in this barrack during the preceding part of the year, and it was mainly attributed to the circumstances alluded to.

Fort Abraham occupies the summit of a hill rather lower than Fort Neuf, about a quarter of a mile to the south-west. The position is healthy as to elevation, but is rather more exposed to malaria from undrained land to westward. The accommodation is limited to one room at present, but there is space for extension, without resorting to a most objectionable scheme which has been proposed for barracking the troops in long casemates formed by arching over some old ditches inside the fort.

Vido Barracks are all placed on the highest and healthiest parts of the island, but from the way in which Fort George barracks have been included in the defences, most of the natural sanitary advantages of the site have been sacrificed. The barracks are close to the works and sunk below the level of the ground outside. The Lunette barracks are somewhat better placed. But, except at Maitland tower, free external ventilation is to a great extent cut off by the method of construction adopted. Vido barracks would in all probability furnish a considerable per-centage of sick if fully occupied for any length of time at their present allotment of space per man.

### 4.—General Construction of Barracks.

None of the barracks are arranged on a really healthy plan. Their construction has apparently been determined either by the size and position of the ground, or simply by the relation which the men's accommodation was intended to bear to the defences. There is no evidence that the question of health has been considered. While stating this fact we at the same time admit that it is not an easy thing to conjoin all the required conditions on sites so circumscribed and otherwise so unfavourable as those of the Corfu barracks, but the best has certainly not been made of these sites.

The Old Barracks in the Citadel built during the Venetian occupation are not suited to their position. Fig. 23 is a plan of the old Venetian Barrack, which consists of double, or back to back barrack rooms, no less than 43 feet broad between the opposite windows. On a high and exposed position in a cool climate this structure would have been less objectionable, but situated as the barracks happen to be at a mean distance of about 50 feet from the lofty rock behind them, and having a long range of other barrack rooms between them and the rock, there cannot be that free perflation of air which is so necessary for health in such a climate. The rooms behind, called the "long rooms," although close up to the rock, are better rooms than those in the large barrack, because they are single, and consequently much narrower, and have windows or openings along two opposite sides. There are, moreover, only two rows of beds between the opposite windows. These "long rooms" afford the only instance of this construction in the garrison, and although the worst placed they are the most airy barrack rooms, showing how much construction can compensate for unfavourable site.

Every room in the Venetian barrack felt close when we were there, although the windows were open and the weather was comparatively cool. Hardly any of the rooms have sufficient window space. The rooms facing the rock were all dull and uncomfortable.

Except the "long rooms," and the old barrack of Fort Abraham, all the other barrack rooms have the windows at opposite ends, with the beds ranged along the dead walls.

Lower Fort Neuf Barracks, a plan of which is shown in Fig. 25, consist of three floors over a basement, and, as in the old Venetian barrack, the rooms are reached by outside corridors and staircases on the side next the scarped rock, on which indeed the stairs are partly supported.

The nature of the position which this barrack occupies in regard to the rock, and its probable influence on the ventilation of the rooms may be judged of by the extent of the basement occupied by solid rock, (shown in the figure,) which has been cut away above to find space for the rooms and stairs.

Each barrack room has two windows at the end facing to the sea, and two smaller windows with a door on the side towards the rock. The distance between these opposite

windows is 48 feet, which is also the length of the room. The beds, 22 and 24 in number, are arranged half on either side the room, so that there are 11 or 12 beds between the opposite windows. The difficulty of thorough ventilation in this case, is of a similar kind to what exists in the old Venetian barrack.

Upper Fort Neuf Barrack is casemated, and has the doors, windows, and loopholes at opposite ends of arches from 32 to 33 feet distant from each other, with two rows, of from 8 to 10 beds each, along the walls between them.

The New Bomb-proof Barracks in the Citadel are on a similar plan. They are casemates 48 feet long, with windows at opposite ends, and 26 beds ranged along the walls, 13 on each side. The rooms are on two floors over a sunk basement; all the rooms on each side the entrance communicate by arches in the division walls, so that their ventilation or rather their foul air is common throughout.

The Barracks in Vido, as shown in Figs. 26 and 27, are part of the works, and consist of short casemates communicating with each other by doors at the ends; the rooms are all on the ground floor except those in the tower at Fort George, which are in two floors. Altogether the rooms in the Lunette barracks are the best; they are 31 feet six inches long and have five beds along each opposite wall, with a door and two loopholes at one end, and three loopholes opposite. These five loopholes are the only means of light, and, except a shaft in the roof, of ventilation also, for ten men, when the door is shut.

Considered in relation to its probable influence on health, it cannot be said that the construction of barracks at Corfu and Vido is favourable. The rooms are too dark, natural ventilation is obstructed from the nature of the plan as well as by the position of the rooms. It would be much better to reserve some of the rooms, especially at Vido, solely for defensive purposes, for not one of the rooms will bear an approach to overcrowding for any length of time without danger to health.

The only barrack construction admissible in these climates, at least so far as concerns health, consists of separate buildings, of very simple plan, with windows on opposite sides, and perfectly free ventilation.

## 5.—Space per Man in Barrack Rooms.

There are only three barracks at the station in which the troops have anything like sufficient space for health. These are the two "long rooms" in the Citadel, and the old uncomfortable room in Fort Abraham. The three rooms hold 212 men out of 2,494, which represents the regulation accommodation of the permanent barracks. All the other rooms are overcrowded. There are 1,433 men with between 230 and 400 cubic feet each, and 288 men have less than 250 cubic feet each. Every man in this garrison except 408 has less than 50 square feet for himself and his bed. The details are given for each barrack in Table 10, Appendix, and the following is the general result for the garrison:—

| Cubic Feet. | | | | | | | | | Superficial Feet. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 to 250. | 250 to 300. | 300 to 350. | 350 to 400. | 400 to 450. | 450 to 500. | 500 to 550. | 550 to 600. | Above 600. | 20 to 30. | 30 to 40. | 40 to 50. | 50 to 60. |
| No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. |
| 288 | 80 | 140 | 925 | 361 | 314 | 80 | 94 | 212 | 368 | 1,294 | 424 | 408 |

This overcrowding, which is very great for such a climate, has attracted the serious attention of the military authorities, and the case has already been represented to the War Office, but there is great difficulty in knowing how to deal with it unless some of the troops be withdrawn. The ground available for barrack accommodation in the Citadel and Fort Neuf is very limited; and if it is considered necessary to keep a larger force than there can be healthy accommodation for, there is of course no help for the evil. It is our duty, nevertheless, to point out what amount of healthy accommodation there is, and how any deficiency may be met in the simplest and most economical way.

There is no regulation as to the extent of cubic space a man should have in such a climate as Corfu, and it is doubtful how far, during summer at least, 600 cubic feet, the amount per man allowed at home, would be sufficient for health, especially when the sites of these barracks and their defective external ventilation is taken into account.

We would propose to adopt the 600 feet as a winter standard, recommending at the same time that it be increased in summer by providing temporary accommodation on healthy ground for the men whenever any disposition to increase of fever manifests itself

in barracks. Assuming this as the standard the following table shows the amount of barrack accommodation at 600 cubic feet per man in contrast with the present amount :—

| Name of Barrack. | Present regulation Number of Men. | Number of Men at 600 Cubic Feet per Man. | Present Average Number of Superficial Feet per Man. |
|---|---|---|---|
| Venetian Barrack - A | 154 | 103 | 40 |
| Venetian Barrack - B | 826 | 598 | 42 |
| Bomb-proof Barrack - | 624 | 396 | 34 |
| Lower Fort Neuf - | 264 | 312 | 41 |
| Upper Fort Neuf - | 160 | 81 | 32 |
| Fort Abraham - - | 56 | 56 | — |
| Fort St. George, Vido - | 252 | 96 | 22 |
| Lunette, Vido - - | 130 | 91 | 44 |
| Maitland Tower - | 28 | 21 | 46 |
| Total - - | 2,494 | 1,654 | — |

This table shows the average deficiency of cubic space throughout the garrison to be one-third, and that there is proper barrack accommodation for no more than 1,654 men.

The present garrison is altogether too large for the accommodation and therefore either the garrison must be reduced to this number or barrack accommodation provided for 840 men. If this latter course be taken, hut barracks on the plan No. II. proposed for Cerigo, of plain brick or stone, properly ventilated and provided with a verandah, would be the most healthy buildings for the purpose. The floors should be raised two or three feet above the level of the ground, and free ventilation provided under the floor, to cut off ground malaria.

## 6.—Ventilation.

The barracks are generally deficient in window space, and as already mentioned, the windows are mostly placed at the far ends of the rooms instead of down the sides. Many rooms in the works have a window only at one end and loopholes at the opposite end, and there are a number of rooms having no windows, only doors and loopholes. With such a construction there cannot be good natural ventilation. The long rooms in the Citadel are the only ones with windows properly placed. None of the rooms have any sufficient ventilation by other means. A few shafts have been put into the old Venetian barrack, but not on a good principle. In some cases in this barrack the shafts have been carried up from the lower rooms through the upper rooms, and openings have been made into the same shaft from the different floors through which it passes. This arrangement of course prevents the shaft from acting and it becomes merely a passage for foul air from the lower to the upper rooms. Shafts and inlets have been built into the works of the Lunette at Vido, but they are placed close together, and at the wrong end of the room, just over the door, where they are least required, and do little or no good.

In several of the casemated barracks the rooms communicate by doors through the piers, so that the foul air passes through all the rooms in common. This construction is contrary to a fundamental principle in barrack ventilation, namely, that each room should be separately ventilated. All these doors should be built up wherever there are separate entrances for the rooms, and where there are not separate entrances, such entrances should be made by outside terraces and verandahs, wherever practicable. There are no fire-places, and these important ventilating agents are not replaced by any others.

The general result of our inquiry is that the ventilation of all or very nearly all the barrack rooms is deficient.

In the reports on each barrack we have stated the improvement required to remedy this material defect, and we shall merely resume generally the principles of ventilation adapted for the garrison.

1st. Windows should be enlarged and additional windows put in wherever a dark corner can be lighted and aired by them.

2d. Wherever practicable the loop-holes should be enlarged and loopholed iron shutters provided for defence use in case of necessity.

3rd. Every barrack-room should have a foul air shaft or shafts, according to the size of the room, carried from the ceiling and placed as near as may be in the middle of the length of the room to above the roof, each room having an independent shaft, not communicating with the shaft of any other room; also one or more inlets for fresh air close to the ceiling at each end of the room. The shafts should be properly louvred

above to prevent the rain beating in. The nature of these shafts has been already described and figured on Plan X. Muir's construction, fig. 19, will be found the best in practice, for upper rooms directly under the roof, as it takes advantage of external air currents in ventilating the room. To prevent down draughts being felt it would be desirable to terminate the lower end of the shaft within the room by a louvre, as shown in Plan X.

4th. Fire-places should be introduced and provided with ventilating fire-grates. (A model of such a grate for burning wood, Plan IV., has lately been sent out.)

5th. As already mentioned, all doors between rooms should be built up, and the rooms should be provided with separate entrances from the open air.

By keeping these principles in view, and adapting them to each room, most of the Corfu and Vido barrack rooms may be ventilated.

### 7.—Drainage.

The drainage of Corfu barracks is generally direct to the sea. Those within the citadel have eight outlets, partly on the north partly on the south side of the rock. The drains are mostly old Venetian drains, the construction and dimensions of which are unknown. Several of the outlets, especially those from the latrines, are not carried into deep enough water, and occasion nuisance.

The barracks in Fort Neuf are drained into the shallow water in front of the lower barrack; but great nuisance to these barracks proceeds from the town drainage already described. The barrack outlets require to be carried into deep water as well as those belonging to the town drains.

Fort Abraham is not drained; it has only a cess-pit. This should be abolished and a proper drain made.

Vido barracks are drained to the sea, but one of the outlets opens into a shallow bay at the landing place, and causes great nuisance in summer. This outlet requires to be carried into open water.

In every instance the fall is much more than sufficient to ensure ample drainage.

### 8.—Latrines.

All the latrines are drained, but they are either constructed imperfectly as water latrines, or they are merely washed out into a drain leading to the sea.

All of them, including the hospital latrine, are very offensive, and in most instances the effluvia from them pervade the atmosphere to some distance, even into barrack rooms and sick wards.

The drains immediately connected with the latrines appear to be defective in several instances, as nuisance is experienced in their neighbourhood.

These matters are all of primary importance in such a climate, and they cannot be neglected without exposing the troops to the risk of fevers.

The general principles to be kept in view in improving the drainage and latrines is to see that the drains are of proper construction and well laid. An ordinary earthenware pipe drain, well laid and closely joined, is quite sufficient for any purpose of barrack drainage in Corfu. All the outlets should be carried by well-secured iron pipes into deep water, and their mouths should terminate in a T head in order that the sea should not strike directly into the open end. All the drains should be ventilated by a pipe of adequate dimensions carried from the highest point of each drain above the roof of the highest building.

The latrines should be reconstructed with Macfarlane's or Jennings' apparatus, Plans XII. and XIII., amply supplied with water, and the latrine buildings should be better lighted and ventilated. All drain openings should be trapped.

These improvements will put an end to the present nuisance and the risk to health constantly accruing from it.

### 9.—Urinals.

The urinals are not of good construction, and are generally great nuisances. They should be of slate or earthenware as in Plans XIII. and XIV. Urinals should be provided in connexion with the barrack rooms. They should be placed in a closet off the barrack room, and separated from it by a ventilated lobby. The best form of urinal for a barrack room is the one recently introduced by Mr. Jennings, Plan XIV. On Plan XV. is shown an arrangement of night urinal suitable for hut barracks in situations where drainage and water cannot be obtained.

### 10.—Water Supply.

All the Corfu barracks are supplied with water from the town aqueduct. Any amount can be had, but in one or two cases, as at the hospital, the pipes are stated

to be too small, and the pipes generally are liable to incrustration from the nature of the water. As already stated the quality is far from being good, and it would be highly advisable to supply the aqueduct from other sources, if such can be obtained. Rain water can also be collected from roofs. There is tankage for 500,000 gallons.

Water is generally laid on for use.

At Vido water is derived partly from wells, partly from rainfall on the stone surfaces of the works. All of these surfaces are swept regularly to keep them clean, and the tanks are provided with filters, which is a great improvement on the arrangements for collecting rain-water at Gibraltar and Malta.

The tank space at Vido can contain about 400,000 gallons. The quality of water is said to be pure and good, but the quantity is not sufficient without great care be exercised to prevent waste. All the roof water is not collected, and the supply would admit of considerable augmentation from this source. Additional wells might also be sunk at favourable points.

At Vido salt water is used for the latrines. It is thrown up by a pump worked by prisoners.

No water is supplied for any purpose at Vido except what is raised by pumps and carried by hand. It might be well to provide iron tanks at a sufficient level to supply water by gravitation to the ablution rooms and kitchens. These tanks should be filled during rain from the works, and at other times by force pumps. The whole of the roof water should be collected for use.

Water might also be obtained from wells.

### 11.—Ablution and Bath Accommodation.

The means of personal cleanliness are defective in all the Corfu barracks, and there are none at Vido. The Venetian barracks have two ablution rooms, situated under the long rooms in a very objectionable position on account of the damp arising from them. The Bomb-proof barracks have their ablution accommodation in the damp, dark, sunk basement under the men's rooms.

At Lower Fort Neuf barrack there is a small inconvenient ablution room, and as the men can only wash thoroughly by throwing water over themselves, there was a much larger consumption of water for washing than necessary, and the whole place was soaked with water when we saw it. There is an ablution shed in the upper barracks.

Properly speaking there is no bathing accommodation at any of the barracks. There are two very bad wooden baths at the Venetian barrack, but none anywhere else, and there are really no means of cleansing the whole body except by sea bathing, which, however excellent as a means of health, is an imperfect means of cleanliness, unless used with marine soap.

All these arrangements require to be changed. There is plenty of fresh water for baths, which should be provided in the proportion of one bath for every 100 men at least. One bath-house would do for the Citadel, and another for Fort Neuf. One would also be required for Fort Abraham.

There being little spare ground for proper ablution rooms at any of the barracks, as much as possible should be done by suitable fittings, to diminish damp from them in the neighbourhood of the men's rooms. Fixed basins with water laid on as in Plan XV. should be introduced instead of the present system of tilting over the basins and allowing the foul water to spread itself about on the benches and floors.

At Vido barracks the men either wash in their rooms or in the barrack yards, and all water has to be pumped up from tanks for use. A properly fitted ablution room, with drainage and water laid on and fixed basins, as in Plan XVII., is required for each barrack. Two baths would be a great advantage, provided sufficient fresh water could be obtained, but this is doubtful. It would be easy to provide two salt water baths, for salt water is already pumped up for other purposes, and if it were used with marine soap, the men could wash themselves thoroughly; at all events this is worthy of a trial.

### 12.—Cook-houses.

All the barracks, both at Corfu and Vido, have cook-houses. Some of them are deficient in ventilation, and are very hot. None have ovens specially belonging to them, except one at Vido. There is an oven in a casemate in the Citadel, not used by the regimental cooks, but by a man who bakes the messes at a fixed charge. At Fort Neuf the men use a commissariat bakehouse. It would be much better to make the kitchens complete, and to provide them with the improved steel boilers and ovens, Plan XVIII., so constructed as to burn wood and economize fuel.

### 13.—Married Quarters.

Nothing could well have been worse than the provision for married soldiers and their families as we saw it. Families were lodged together in large rooms in the Venetian barrack, in common, much overcrowded and without regard to decency, or they occupied very inferior huts. The accommodation was so bad and so deficient that two inferior houses in Corfu were rented to increase it. Since our inspection a range of married quarters has been authorized within the Citadel, and this great deficiency will be in part supplied by excellent healthy accommodation. It is an obvious principle in this crowded garrison to admit of no encroachment on the men's rooms, but until all married people are properly lodged it is hardly possible to avoid placing them in barrack rooms.

### 14.—Women's Wash-houses.

There is one excellent women's wash-house in the Citadel, but it requires better drainage and proper fitting up. Another not used is attached to Lower Fort Neuf barracks.

There is none in Vido.

The accommodation should be extended and improved by providing fixed tubs, water laid on, boilers, and means of drying and ironing.

### 15.—Guard Rooms and Cells.

The following table gives the accommodation in the way of guard rooms and cells at Corfu. We have received no return of the number of men usually on guard, and we have therefore given the number each guard room ought to contain at 600 cubic feet per man:—

| Barrack. | Number of Men Guard Room will contain, at 600 Cubic Feet per Man. | Cells. | |
|---|---|---|---|
| | | Number. | Cubic Feet per Prisoner. |
| Artillery, Citadel - | 12 | 1 | 536 |
| Venetian „ - | 7 | None. | — |
| Bomb-proof „ - | 4 | 4 | 661 |
| Fort Neuf - - | 7 | 4 | 832 and 1,664 |
| Fort Abraham Crimean wooden hut. | — | — | — |

The guard rooms generally are too small for the men on guard, and they all require more ventilation by shafts and inlets. The local government guard rooms are very inferior, and certain of them, such as that near the custom house, hardly fit for occupation. This is a matter which requires to be rectified. The construction of guard room shown on Plan VI., is suitable for the purpose.

The cells are generally too small for the climate, and they all require improved ventilation.

The present establishment in the Citadel consists of a block of cells built close to the rock. Indeed the lock-up room has its back wall against the rock, which is very objectionable for health. There is no ablution room, and the men have to wash in the yard.

The privy at the back of the cells is over a cesspit; it is very bad and requires reconstruction with drainage and a water latrine.

We next proceed to describe the barracks more in detail.

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## III.—DETAILED REPORTS ON THE BARRACKS AND HOSPITAL.

*Citadel Barracks.*

There are two barracks within the Citadel:—

1. The old Venetian barrack, including the Artillery barrack and the "long rooms."
2. The Bomb-proof barracks.

### 1.—Old Venetian Barrack.

This is a large old building, consisting of a centre with two wings projecting from its northern face.

It is situated on the northern side of the Citadel rock, on a platform about 40 feet above the sea, from which the front is separated by a narrow esplanade.

The rock, as already stated, rises to a considerable elevation behind the building, and cuts off the ventilation on the south side. Close under the western extremity of the barrack there is a small harbour (the Mandracchio) enclosed by low stone walls and containing stagnant water. The sewer from the barrack privies enters the sea close to the south end of this harbour, but outside its wall. From both sources, viz., the stagnant water of the Mandracchio and the sewage, much nuisance at times arises.

The line of the barrack is almost due north and south. The northern end and wing are occupied as officers' quarters. The centre part is used as an infantry barrack, and the southern end and wing are occupied by the Royal artillery.

The "long rooms" are built on a ledge of rock immediately behind the Venetian barrack, at a somewhat higher elevation, and contract still more the limited space behind the main building.

The site is certainly not a favourable one, but in this, as in other similar cases, its choice has apparently been the result of necessity. The only improvement of which the site admits is carrying the privy sewage out a sufficient distance to seaward, to diffuse it in as large a body of water as possible, and to open a few arches in the walls of the Mandracchio to admit of a more free circulation of water through it.

The barracks are four floors in height. The western face of the buildings, next the rock, is protected by verandahs, affording at the same time access to the rooms. Verandahs are also carried along the south face of the projection containing officers' quarters. There are no verandahs on the east side, and the sun beats into the rooms with great force during the forenoon.

The ground floors are used chiefly for stores, but two or three rooms are occupied by soldiers and as married quarters, affording accommodation of an inferior description.

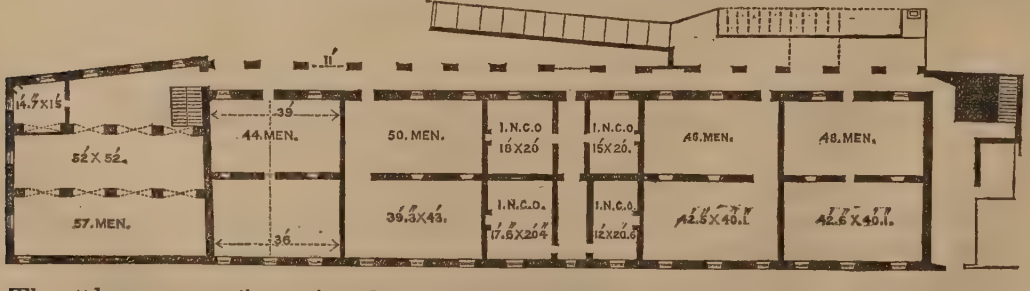
The three upper floors are divided into barrack rooms in the following manner:—

The centre building has party walls carried across it from back to front, dividing it into five separate barrack houses. The centre house of the five has a passage right across it from back to front, on each side of which there are two non-commissioned officers' rooms. The other four houses are divided by a party wall, running the lengthway of the building, into two rooms each, one facing the east, the other facing the west. There are doors and arches through this wall to allow of the rooms being entered from one another. The distance between the front and back windows, through the arches, is about 43 feet, which is double what it ought to be for really good ventilation, and there are four rows of beds between the opposite windows. Each of these double rooms has three windows to the east, overlooking the sea, and two windows and a door to the west opening on the verandahs, and looking on the lofty rock and on the "long rooms" behind.

The artillery barrack rooms are partly entered from the ground level and partly from the south end of the verandahs. The upper rooms in this part of the barrack are 52 feet square, and have two rows of piers down the middle. They have three windows facing the rock, two windows looking to the south and one window to the east.

The deep north-east angle of these rooms is 50 feet from the nearest window, and of course it is very gloomy and badly ventilated. If it were practicable to open a large oblique window in this angle it would improve the light and ventilation of these rooms to a very considerable degree. The general arrangement of these rooms is shown in the following Fig. 23:—

Figure 23.—Ground Plan of the Venetian Barrack, Citadel, Corfu.




The "long rooms" are in a long narrow building close upon the rock, which rises vertically within a few feet of their back wall. The building is in two floors; the lower floor is used for stores, ablution room, &c., and the men are accommodated only on the upper floor. These rooms have small windows on opposite sides; they are of a good height, and afford, on the whole, the best accommodation in the barrack.

*Accommodation.*—The artillery part of the barrack (known as A. barrack) contains four men's rooms and three rooms for non-commissioned officers, affording regulation accommodation for 157 non-commissioned officers and men, the details of which are given in the following table:—

A. Barrack.

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| *Men.* | | ft. in. | ft. in. | ft. in. | | | | ft. | ft. |
| No. 1 | 26 | 39 6 | 26 0 | 10 6 | 414 | 38 | 2 | 4 | 6 |
| 2 | 36 | 58 0 | 26 0 | 10 6 | 439 | 41 | 5 | 4 | 6 |
| 3 | 46 | 71 0 | 26 0 | 10 0 | 401 | 40 | 7 | 4 | 6 |
| 4 | 46 | 71 0 | 26 0 | 10 0 | 401 | 40 | 7 | 4 | 6 |
| *Non-commissioned Officers.* | | | | | | | | | |
| No. 1 | 1 | 13 0 | 15 3 | 10 6 | 2,087 | 198 | 2 | 4 | 6 |
| 2 | 1 | 16 0 | 17 6 | 10 0 | 2,800 | 280 | 2 | | |
| 3 | 1 | 16 0 | 18 0 | 10 0 | 2,880 | 288 | 2 | | |
| Guard Room | — | 44 0 | 23 0 | 7 6 | — | — | 3 | 3 6 | 4 3 |
| Cell | 1 | 11 0 | 6 6 | 7 6 | 536 | 71 | — | — | — |

*Overcrowding.*—The men's rooms in the artillery barrack are overcrowded to the extent of at least one-third, simply as regards cubic space. But the actual overcrowding is greater, because from the square form of the rooms there are six rows of beds between the front windows and the opposite dead wall. Assuming 600 cubic feet per man as our standard (although this standard is applicable only to barracks at home) the proper numbers in each room would be as follows:—No. 1 room, 17 men; No. 2, 26 men; Nos. 3 and 4 rooms, 30 men each. This would give 103, instead of 154 men, for the artillery barrack, which is the utmost number it ought to contain.

The accommodation in B. barrack (infantry), including the "long rooms," consists of 18 men's rooms and 17 rooms for non-commissioned officers, holding 843 non-commissioned officers and men. The rooms for non-commissioned officers give from 2,736 to about 4,000 cubic feet for each man. The following table gives the statistics of the men's accommodation:—

B. Barrack.

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men at 600 Cubic Feet each. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | No. | Height. | Width. |
| Nos. | | ft. in. | ft. in. | ft. in. | | | | | ft. in. | ft. in. |
| 1 | 36 | 39 6 | 20 0 | 10 6 | 230 | 22 | 13 | 4 | | |
| 5 | 15 | 29 6 | 20 0 | 10 6 | 413 | 39 | 10 | 2 | | |
| 14 | 42 | 40 6 | 40 0 | 10 6 | 405 | 28 | 28 | 3 | | |
| 15 | 39 | 40 0 | 42 6 | 10 0 | 436 | 43 | 28 | 5 | | |
| 20 | 41 | 40 0 | 42 6 | 10 0 | 414 | 41 | 28 | 5 | | |
| 21 | 42 | 39 3 | 43 0 | 10 0 | 400 | 40 | 28 | 5 | | |
| 22 | 47 | 39 3 | 43 0 | 10 0 | 355 | 35 | 28 | 5 | | |
| 26 | 46 | 52 0 | 52 0 | 10 0 | 597 | 59 | 45 | 8 | | |
| 27 | 46 | 40 0 | 44 0 | 9 9 | 373 | 38 | 28 | 5 | 5 9 | 4 0 |
| 32 | 44 | 40 6 | 44 0 | 9 9 | 395 | 40 | 28 | 5 | | |
| 33 | 42 | 39 3 | 44 3 | 9 9 | 418 | 43 | 29 | 5 | | |
| 34 | 47 | 37 0 | 44 6 | 9 9 | 329 | 35 | 26 | 5 | | |
| 38 | 48 | 52 0 | 52 0 | 10 0 | 563 | 56 | 45 | 8 | | |
| 43 | 46 | 40 0 | 44 0 | 9 0 | 344 | 38 | 26 | 5 | | |
| 44 | 42 | 40 6 | 44 0 | 9 0 | 382 | 42 | 26 | 5 | | |
| 45 | 47 | 39 3 | 44 3 | 9 0 | 332 | 37 | 26 | 5 | | |
| 47 | 77 | 145 3 | 27 0 | 17 0 | 873 | 57 | 77 | 16 | 4 2 | 5 6 |
| 48 | 79 | 148 0 | 28 0 | 17 0 | 891 | 52 | 79 | 16 | | |
| Total 18 | 826 | — | — | — | — | — | 598 | — | — | — |
| Guard Room | — | 20 0 | 15 6 | 10 0 | — | — | — | — | — | — |

*Overcrowding.*—The overcrowding in this barrack is excessive. In several of the rooms it is as great as in some of the worst barracks at home. We have added a column

to the table giving the accommodation at as near as may be 600 cubic feet per man for each room, from which it will be seen that the rooms will accommodate 598 instead of 826 men, their present number.

*Ventilation.*—The ventilation in all the rooms is deficient. It is provided for chiefly by doors and windows, but the window space is much too small, and the rooms too wide in proportion to their height, to admit of a sufficient renewal of air by these means at night. Some of the rooms have ventilating openings in the walls; others have had shafts recently carried up from their ceilings. In one or two instances these shafts merely carry the foul air from the rooms below to the rooms above. The "long rooms," from their greater height, and from having windows on opposite sides, are better ventilated, but not sufficiently so.

This old barrack, as a whole, is of so bad a construction, and its position is so unfavourable for thorough ventilation, that it would be difficult to lay down a detailed plan at once and to predict that it would be successful. It will be more satisfactory to adopt certain principles of ventilation applicable to these buildings, and to apply them until the ventilation is satisfactory. The following are the principles we propose for adoption:—

1. There should be more window space wherever it can be obtained. In the large artillery rooms there should be large windows in the angle of junction between the wing and the main building, as already mentioned. In all the rooms the windows should be carried up close to the ceilings, and the added part should be independent of the present window, and should open separately.

2. Each room (according to its size) should have one or two ventilating shafts carried up in the line of the central arched wall, from the ceiling above the roof. The shafts should ventilate only the room to which they belong. All openings in existing shafts, by which the foul air of any one room can communicate with the atmosphere of any other room, should be closed. Every room in the building must have its separate and independent means of ventilation.

3. Each room should have louvred inlets for fresh air in the outer walls between the windows close to the ceiling.

These outlet shafts and inlets should be constructed on the principles already laid down and figured in Plan X.

After the works are executed the ventilation should be examined at night, and the inlets increased in number or enlarged until the requisite degree of purity of the air is arrived at. But it should be kept in mind that hardly any means of ventilation, except sleeping with all the windows open, will ensure even a tolerable state of the atmosphere with the present great overcrowding. It is absolutely necessary for health that the overcrowing should be put a stop to.

There are some double rooms on the lower floor which have no through draught. This should be obtained by openings in the division walls:— A doubtful expedient, but it may be of use in the special cases alluded to, provided the full amount of cubic space per man be given.

The best ventilation for the "long rooms" will be obtained by louvres along the ridge, and by inlets for fresh air along the eaves on both sides.

*Ablution and Bathing Accommodation.*—There are two ablution rooms belonging to the Venetian barracks, situated under the "long rooms," with only a boarded floor intervening between their wet surfaces and the place where the men sleep.

They have water laid on, and flagged floors with a grating in the middle, down which the waste water escapes after having been thrown over the floor. The situation of these washing places is objectionable as regards health. If there is any available open space in which they can be reconstructed this should be done; but if not, it would be better to limit the exposed wet surface as much as possible, by having fixed basins similar to those in Plan XV. and foot-pans, with water constantly laid on. Each room has two wooden fresh water baths of a very inferior kind, which should be removed and a proper provision of slate or metal baths should be made to afford the requisite means of cleanliness. One such bath for every 100 men, with water laid on, is required, and one bath-house would be sufficient for the Citadel.

*Cook-houses.*—There are two cook-houses, one belonging to the B. barrack, the other to the artillery. The former is a detached building, with abundant roof ventilation. It has boilers of the old pattern, but no oven. The artillery cook-house is in the ground floor of the Venetian barrack, and has boilers, but no oven. It is defectively ventilated. The only means of varying the cooking is by an oven attached to the cook-house of the Bomb-proof barracks, above 1,000 feet distant from the centre of the Venetian barrack, and on the opposite side of the Citadel.

It would be desirable to discontinue the present artillery cook-house under the barrack and to adapt the detached cook-house for all the men in A. and B. barrack, by fitting it up with a Benham's improved cooking apparatus for 800 men in two separate divisions. The cook-house should also be provided with a drained sink, with water laid on, a receptacle for fuel, and other conveniences.

*Women's Wash-house.*—An excellent wash-house has been recently erected at the south end of the barracks. It is provided with stone benches for holding tubs, and has moveable boilers, but there are no proper fittings similar to those now being introduced at home stations. There is sufficient roof ventilation, but the drainage is imperfect, and complaint is made that the women have often to stand in water while washing. This could easily be remedied if proper fittings were put up. A room for ironing linen is also required.

*Water Supply.*—Water for the Citadel barracks is obtained by pipes from the aqueduct belonging to the Ionian Government. There is a large tank capacity within the Citadel, and the supply is said to be unlimited. In some respects the distribution appears to be defective. Water should be laid on over the whole Citadel, so as to be always obtainable for lavatories, baths, cook-houses, wash-houses, latrines, drinking fountains, and other purposes.

*Drainage, Latrines, Urinals, &c.*—The fall for drainage is ample from all parts of these barracks. The drains were mostly constructed during the Venetian occupation, and very little is known about them. They are said to be sufficient for every purpose, There are four outlets direct to the sea on this side of the Citadel; but they should be carried into deep water to prevent the nuisance now arising from them.

The *Latrines* are close to the defences, opposite the centre of the barracks, and a few yards distant. They are defective in plan, and very offensive. They require entire re-construction on Macfarlane's or Jennings' principle, and they should be properly supplied with water. The outlet of these privies is too near the shore. It should be carried out by an iron pipe into water sufficiently deep to prevent nuisance.

The latrines should have divisions of seats and half doors, and the buildings should be freely lighted and ventilated.

The urinals should be reconstructed in the manner shown in Plans XIII. and XIV. and supplied with water for cleansing.

There is an ashpit beside the privy, which ought to be removed, and the barrack refuse collected in iron boxes and taken away daily.

*Canteen.*—This place was not in very good condition when we saw it. The ventilation and lighting are insufficient, and the rooms were not clean. It requires improvement in these respects.

*Married Soldiers' Quarters.* — There were none, properly speaking, except a few inferior wooden huts, affording very deficient accommodation. Men's accommodation had consequently been misappropriated in the already overcrowded barracks. One room for 42 men had been cleared of its occupants to make way for eight married soldiers, who could not be otherwise accommodated.

Between 40 and 50 married quarters are required, and one building, already mentioned, has been sanctioned since our return, and is in course of construction at the south end of the Venetian barrack.

The accommodation which existed at the time we were in Corfu was of a very bad kind, and quite unfit for decent occupation.

The sanitary improvements required for the Venetian barracks may be summed up as follows:—

More window space, improved ventilation, reduction of overcrowding, improved ablution and bath accommodation, improvements (including roasting ovens) for cook-houses, fittings for women's wash-house, improved latrines, urinals, and drainage.

### 2.—Bomb-proof Barracks.

These casemated barracks were completed and first occupied in 1847. They are situated across the entrance to the citadel, the gateway of which passes through the centre of the line. The buildings are in three floors, one of which, sunk below the surface level, is used as stores, and contains in addition the ablution room and women's wash-house of the barrack; the other two floors are occupied as barrack rooms. The whole block is about 430 feet long. It is isolated from other structures, but the external ventilation is not very good, because on the south side the Citadel rock and buildings of various kinds rise at no great distance, far above the top of the barracks, and on the north side a range of engineers' workshops, longer than the barracks, as well as the defen-

sive works, run parallel with the range at about 50 feet distance, and interfere with the free circulation of air on that front.

The casemates are arranged side by side in two floors; they have windows at the opposite ends, and the distance in the length of the arch between the windows is 48 feet. So far as their general plan is concerned, they are among the best examples of casemated barracks we have seen; and with a few improvements in the details, they would form as good casemated barracks as could be constructed on the site.

The rooms are side by side, with the piers intervening. There are two entrances, one on either side the gate, and all the rooms communicate by doorways in the piers, which afford the only means of access to the rooms on each floor. The result of this arrangement is, that all the rooms in a suite have a common circulation of foul air through them. This is a defect in detail admitting of easy removal; and in doing so another defect can be remedied. The one we allude to is, the want of verandahs along the south front of the barrack, which is exposed, in a not very airy position, to the powerful summer sun during the whole day. If a verandah, supported on pillars, were carried along the south face to shade the upper floor of rooms, and a terrace for access to those upper rooms, answering as a verandah for the lower rooms, were constructed, and if means of access to the lower rooms were provided, by platforms carried across the sunk area, two great improvements would be obtained at the same time. 1st. All the doors between the barrack rooms could be built up, and so every room would have its own separate ventilation; and, 2nd, the south face of the building would be sheltered from the sun.

It would, of course, be necessary to convert one of the windows in the south front of each casemate into a door.

The accommodation afforded by this barrack is contained in 34 rooms, having regulation space for 634 non-commissioned officers and men at from 371 to 400 cubic feet and 34 superficial feet per man. The following Table gives the details:—

| Number of Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Windows per Room. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| | | ft. in. | ft. in. | ft. in. | | | | ft. | ft. |
| Nos. 1 to 12, twelve rooms - - | 26 | 48 0 | 18 6 | 10 10 | 400 | 34 | 3 | 8 | 4 |
| Nos. 13 to 24, twelve rooms - - | 26 | 48 0 | 18 6 | 10 0 | 371 | 34 | 3 | 8 | 4 |
| *Non-commissioned Officers, Ten Rooms.* | | | | | | | | | |
| Nos. 1 and 2 - - | 1 | 15 0 | 21 0 | 10 0 | 3,150 | 315 | 1 | — | — |
| 3 and 4 - - | 1 | 10 0 | 21 0 | 10 0 | 2,100 | 210 | 1 | — | — |
| 5 and 6 - - | 1 | 17 0 | 21 0 | 10 0 | 3,570 | 357 | 1 | — | — |
| 7 and 8 - - | 1 | 12 3 | 21 0 | 10 0 | 2,572 | 257 | 1 | — | — |
| 9 and 10 - - | 1 | 12 3 | 21 0 | 10 10 | 3,044 | 304 | 1 | — | — |
| Guard Room, Nos. 1 and 2 | 4 | 12 6 | 18 6 | 10 0 | 578 | 58 | 2 | — | — |
| 4 Cells - - - | 1 | 11 6 | 5 9 | 10 0 | 661 | 66 | — | — | — |

*Overcrowding.*—All the men's rooms in this table are overcrowded. The first 12 rooms (Nos. 1 to 12) should contain no more than 17 men per room. The last 12 rooms (Nos. 13 to 24) should contain 16 men per room, giving the nearest possible approximation to 600 cubic feet per man. The whole barrack, at this rate, has accommodation for 396 men, instead of 624, the present number of rank and file.

*Ventilation.*—The rooms are ventilated by means of the windows, when open, a small opening at the ceiling, and another near the floor, communicating with the outer air, and covered with wire gauze. Each room requires an outlet shaft carried up as near the middle of its length as possible above the roof, as in Plans X. and XI. figs. 1 and 2. There should also be an inlet of the requisite area, for fresh air at each end, close to the ceiling. These means would be sufficient to keep the air pure, if the doors between the rooms were built up, separate doors opened for each room, and the number of men reduced to the extent already stated. There should be fire-places in all the rooms, with improved ventilating fire-grates of the pattern already described, Plan IV. This would be an excellent barrack of its kind were these improvements in detail carried out.

*Ablution and Bath Accommodation.*—The ablution room is in the basement story of the barracks, in a dark and damp casemate. There is a stone ablution table, with water laid on, but no gratings for the men to stand on. The only means for removing the foul water is by a grating in the middle of the floor. There are no baths.

The place is not very suitable for men to wash in after leaving their beds. If space could be found for a proper ablution room above ground it would be a great improvement. As already stated, a general bath room for the whole Citadel would be sufficient.

*Cook-house.*—The cook-house is situated in a casemate at a short distance from the west end of the barrack. It has boilers of the ordinary pattern. There is a bakehouse in another casemate alongside it, let out to a man who bakes the soldiers' dinners at 2*d.* for a large dish and 1*d.* for a small one.

Instead of this arrangement each cook-house should have improved steel boilers and oven, as in Plan XVIII., and the cooking should be superintended by the regimental cook.

The yard in front of the cook-house is badly paved, and was wet. It should be flagged or paved with close-fitting square setts, and carefully channelled for drainage.

A similar defect exists in other paved places about this barrack.

*Latrines.*—These are in a long casemate on the western rampart. They have a trough, with ball valve, and are discharged into the sea. Macfarlane's or Jennings' latrines should be substituted for the present very offensive arrangement. The casemate itself is very dark, and is imperfectly ventilated.

*Reading Room.*—This is a large room, properly the court-martial room, but used as a reading room. It is very deficient in ventilation, and requires to be better lighted at night.

*Schoolroom.*—The garrison schoolroom is in a two-story building, opposite one end of the Bomb-proof barracks. There are stores on the ground floor, and the schoolroom above. It has windows all round, but no ventilation.

This room is used for amusements after school hours, but the accommodation it affords is inadequate. An additional story should be put on it, if practicable. The whole should be thoroughly ventilated, and accommodation provided for supplying tea, coffee, &c., for the men. It would then make very good garrison recreation and reading rooms.

*Gymnasium.*—The Citadel of Corfu is the only place where we have found a gymnasium in operation. It is a large substantial wooden building, constructed out of the proceeds of the canteen fund before that fund was abolished, and is well supplied with the necessary apparatus. It would be a great advantage to the health of the troops to provide similar covered gymnasia at all the Mediterranean stations.

The *Garrison Church* is a large convenient building, but insufficiently ventilated. It requires large louvres in the ridge and inlets for fresh air along the eaves.

*Main Guard.*—This is a large lofty casemate on one side of the gateway. It has three windows and a ventilating shaft, but the ventilation is insufficient for the number of men in it. The lock-up room is on the opposite side of the gateway. There are no cells, and all kinds of prisoners have to be put together in the lock-up. Cells are very much wanted.

Several of the buildings, containing engineer's orderly room, stables, military secretary's house, &c., are very old and not in good condition. They should be rebuilt.

*Married Soldiers' Quarters.*—None specially belonging to this barrack.

The sanitary improvements required for these barracks are:—1. Increased cubic space for the men. 2. Improved ventilation. Closing up the arches between the rooms and providing access from the outside to each room by terraces and platforms, also verandahs. Ventilating fire grates. 3. Improved ablution accommodation and baths. 4. Improved cooking apparatus. 5. Improved surface drainage and latrines. 6. Additional space for reading and recreation rooms. 7. Ventilation of the garrison church. 8. Ventilation of guard room. 9. Cells and married quarters.

### 3.—Garrison Hospital.

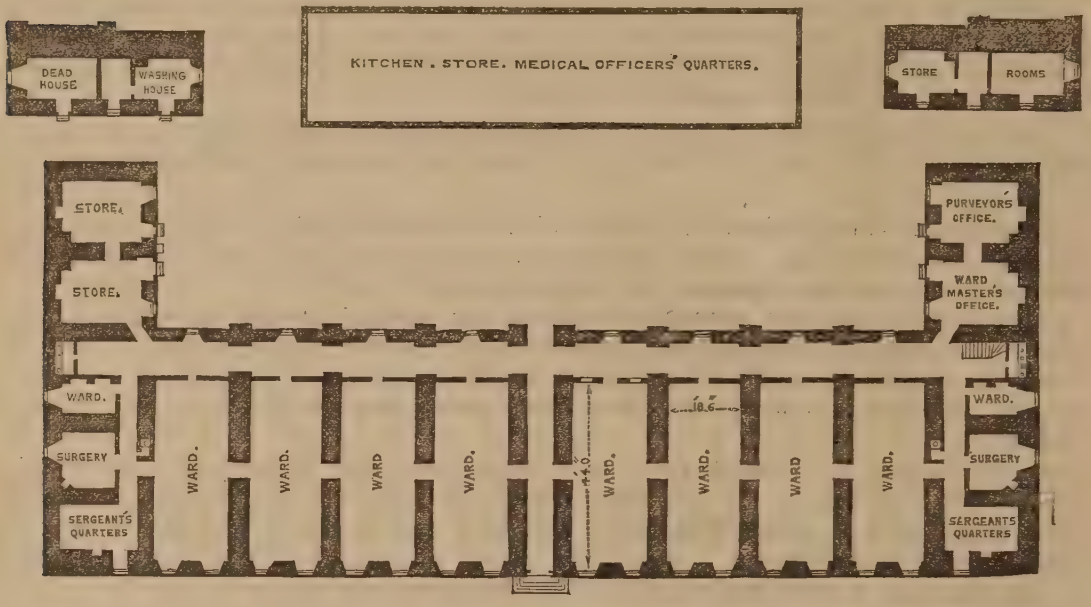
This is a bomb-proof building two floors in height situated on a narrow neck of ground within the Citadel, 119 feet above the sea level, between the two high rocks already described. The building is erected east and west, and its windows face north and south.

The north side is freely exposed to all the cool breezes, except in so far as they may be interrupted by a line of trees extending along the esplanade. The south side

is exposed to the sun, and ought to have the full benefit of the southern winds, but unfortunately a two story building has been erected, mainly for medical officers' quarters, parallel with the back of the hospital, and close to it, producing stagnation of the outer air, which in such climates as that of Corfu amounts to bad external ventilation. On the east and west sides the ventilation is also interfered with by the projecting rocky eminences.

The ground plan of the building is given in the following, Fig. 24. It has a front to the north, about 242 feet long, formed out of 11 arches on each floor, built side by side like a bridge, and the ends closed to form windows. The centre arches above and below are only sufficiently broad to afford a passage through the building. On each side of this passage there are four arches used as wards, and the terminal arches, one at each end, are divided by walls into three rooms, intended for serjeants' quarters, surgeries, and small wards for special cases.

Figure 24.—Ground Plan, General Hospital, Corfu.




It will be seen that all the larger wards communicate by doorways through the piers intervening between the arches, so that the whole ventilation of each floor is in common.

The end arches are continued out to the south behind the main line of the building, in the form of two wings used for store rooms, &c.; beyond these are two small buildings used as store rooms, wash-house, dead-house, &c. The building for officers' quarters, kitchen, &c., mentioned above, completes the fourth side of the narrow court behind the hospital. Beyond this line of buildings is a narrow esplanade overlooking the sea, and 100 feet above it, and against the wall bounding the esplanade is a row of very offensive privies drained to the sea, right to the windward of the hospital, and from which great nuisance is experienced both in the medical officers' quarters and in the hospital kitchen below them, as well as occasionally in the hospital itself.

It is worthy of remark that the only wards in the hospital in which there was a proper degree of freshness in the air at the time we were in them, were those wards on the upper floor which received the sea breeze, past the end of the medical officers' quarters.

Access is obtained to the upper floor of the hospital by an outside stair, carried up in the narrow court behind, still further obstructing the ventilation on that side. All the wards above and below are entered from an enclosed corridor, about three yards wide, which covers the entire south front of the building.

The prevailing winds during five months of the year are southerly, and interposed between these winds and the sick wards there are, 1st, the offensive privies on the esplanade, 2nd, the cook-house stores and medical officers' quarters, 3rd, the obstruction afforded by the stairs, and, lastly, the closed corridor along the south side of the hospital.

These structural defects constitute the most important features in the sanitary condition of the hospital, and we shall recur to them.

The hospital was constructed in 1835, and the following table shows the amount of accommodation it was originally intended to afford for the sick of the garrison.

| Wards. | Regulation Number of Beds per Ward. | Dimensions of Wards. | | | Cubic Feet per Bed. | Superficial Feet per Bed. | Windows per Ward. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| | | ft. | ft. in. | ft. | | | | ft. in. | ft. in. |
| 16 | 18 | 44 | 18 6 | 12 | 542 | 45 | 2<br>2 | 7 9<br>4 6 | 4 8<br>2 3 |

*Overcrowding*.—This table is quite sufficient to show the very inadequate appreciation of the extent of space required for sick men in such a climate, which prevailed when the hospital was built.

Several years ago the medical officers obtained the removal of six beds out of each ward, thereby increasing the space per bed to 814 cubic and 67 square feet, but a further reduction was considered necessary to enable the wards to be safely used. And the War Office decided that each of the present wards should hold seven beds and no more. The War Office decision, if carried out, would give 1,395 cubic feet, and 116 square feet per bed, and 112 beds for the whole hospital, leaving 108 beds to be otherwise provided for.

The total number of sick for which there was accommodation on the first allotment of space was 288. On the present allotment of 12 beds per ward the total number of beds is 192. But the present average strength of the garrison exceeds 2,200, and, unless the overcrowded state of the barracks, to which we have already alluded, be met by reducing the garrison, 220 beds with sufficient cubic space per man will be required to accommodate the sick. It has been proposed to obtain this accommodation by erecting additional hospitals at Vido and Fort Neuf. But before discussing this point we shall inquire what extent of accommodation the present buildings can be made to afford. In dealing with the question of altering the present buildings, we must distinctly state that the accommodation so obtained would be by no means all that could be desired as to quality. All we propose to do is to ascertain whether by any alterations we can obtain a larger amount of space for sick than at present, without incurring any additional disadvantage of a sanitary kind, or whether in seeking more space we may not be able at the same time to improve in some degree the general sanitary condition of the building. We believe this can be done.

By reference to the plan and the table of accommodation it will be seen that each ward is 44 feet long; and by including the portion of the corridor at the end, each ward may be lengthened to 53 feet. To render the additional space so obtained available for sick all the arched doorways between the wards would have to be built up, and all the partitions dividing the ward from the corridor pulled down. Each ward would thus extend from the front to the back wall, and would have no communication with any other ward. The corridor window would have to be made into an entrance door, and a lofty window extending to within a foot of the ceiling would have to be made on each side this new doorway. Entrance to the ground floor wards would be obtained from an open verandah supported on iron pillars, and to the upper floor by a terrace forming the roof of this verandah. By carrying the pillars up, they would support a verandah over the upper floor windows. The stair giving entrance to the upper verandah should, if possible, be carried up in the central passage, or at all events in such a way as not to interfere with the circulation of air in the court behind.

By effecting these alterations the contents of each ward would be raised from 9,768 cubic feet to 11,760 cubic feet, and considering the special difficulty of obtaining more space for extending the hospital in any other way, as well as the improved ventilation which would be afforded by the alteration suggested, we should propose to place 10 beds in each ward at 1,176 cubic and 98 square feet per bed. This would give space for 160 beds, and leave 60 beds to be otherwise provided for. These additional beds could be obtained by removing the medical officers' quarters, and converting part or the whole of the upper floor of the building where they are situated into sick accommodation at say 1,200 cubic feet per bed, but we cannot recommend this to be done unless the hospital kitchen were removed from its present position on the ground floor, where, in the event of the proposed alterations being carried out, it would be under a sick ward, a position always to be avoided, especially in a warm climate.

The only satisfactory method of obtaining the additional space required would be to raise an additional storey on the present building. Space for from 80 to 90 additional beds might be provided in this way, by forming a new set of wards to correspond to those on the other floors, and this would be the best ward space by far in the hospital. The present appropriation of the building behind would in that case be left as it is.

It is possible, however, that the walls of the hospital would not bear an extra story if made bomb proof, as the present hospital is intended to be. If so, we would suggest that the additional story should be of light construction, such as a wooden structure slated and ceiled, carried the whole length of the present hospital so as to form two wards for 28 men each, with the necessary ward appurtenances.

At all events the maximum number of beds which the present hospital will contain, without additions, if altered in the manner suggested, is 160.

We have stated the case under its various aspects, and we are of opinion that the least costly way of providing the accommodation so urgently required, while the garrison remains of its present strength, would be to add the proposed story, and to improve the present wards in the manner suggested.

*Ventilation and Warming.*—As already stated, the external ventilation of the hospital is defective, although its local position is well adapted for securing a free movement of the air. There are no special means of ventilating either wards or corridors. The wards have two windows facing the north, each of which is 7 feet 9 inches high, and two windows and a door opening into the corridor, these windows are only 4 feet 6 inches high. There is a small opening a foot square into the corridor over each door. The large space over the heads of the windows is unventilated, and is a receptacle for foul air. There is one window in the corridor opposite the door of each ward. We have already shown that the foul air of all the wards intermingles by the doors in the division walls and by the corridors.

There are no fire-places; warming is effected in winter by iron stoves in each alternate ward.

These arrangements are insufficient for keeping the air pure, and the following improvements are required:—1st. Each ward should have a fire-place with the largest size ventilating grate of the pattern shown on Plan IV. Space can readily be found for this. A foul air shaft having an area double that recommended in our report on barracks and hospitals for home stations should be carried up alongside the chimney to above the roof. It should be louvred above; and where it opens into the ward, there should be louvres to throw any chance down draughts of air in windy weather up to the ceiling.

The windows should all be lengthened to within a foot of the ceiling, and the added part of the window should open separately by cords, to ensure a thorough draught when necessary. Besides this there should be a ventilating inlet inserted at each end of the ward, close to the ceiling, and their conjoint areas, like those of the outlet shafts, should be double those required for home use. The ventilation is that shown in Plan XI., Figs. 1 and 2.

*Water Supply.*—This is derived from tanks partly supplied by rainfall, partly from the aqueduct. It is raised for use by pumps. It has been proposed to provide separate tanks for the aqueduct water, to prevent inconvenience arising from mixing both waters together. The available supply is sufficient for all purposes, but it requires to be better distributed to waterclosets, &c., by head pressure. In all hospitals hot and cold water should be available for the use of the sick, from water taps, and the only pumps should be force pumps to throw the supply to a proper height for constant use in cases where head pressure cannot be otherwise obtained.

*Drainage, Latrines, Waterclosets.*—The facilities for drainage are ample, and the distance from a vertical fall of 100 feet to the sea is not more than 50 yards. A two feet barrel drain is used to carry the sewage this distance. The surface drains are paved. They should all be flagged and the channelling very carefully done.

There is a set of latrines constructed on the south of the hospital against the parapet. They were very offensive, but have been replaced lately by Jennings' latrines, with water for cleansing. If the alteration has not abated the nuisance it would be advisable to ascertain whether some less objectionable position could not be found for them.

A number of waterclosets have been put up within the building, but these closets cannot be used. Some of them have been walled in, and the others are in such a condition that the sick have to walk across the court to the latrines already described, in all states of the weather.

Each end of the hospital requires three or four waterclosets on each floor. They should be constructed in a projection thrown out at the end of the proposed terrace and verandah. They should be of the most approved construction, properly ventilated, and supplied with water and drainage.

*Ablution and Bath Accommodation.*—There is no proper lavatory or bath accommodation. A small separate building in the back yard is divided into two portions, one being the dead house and the other the lavatory, in which are the ordinary moveable metal basins and tin baths. Such arrangements are not suited to permanent hospitals. The projecting buildings in which the waterclosets are to be placed should afford space on each floor for wash-hand basins with hot and cold water laid on. Three such basins, as those shown on Plan XV., and one fixed bath, also with hot and cold water laid on, would be sufficient for each end of each floor. That is 12 basins and four baths for the whole hospital. An additional slipper bath, on wheels, for each floor, would enable bed-ridden patients to be bathed in the wards when required. Space should be provided for containing the slipper bath. It should have taps for hot and cold water to fill the bath, and also a sink in the floor for running the water off after use.

*Cook-house.*—There used formerly to be four small kitchens belonging to this hospital. Lately these have been consolidated, and the cooking is now done on the ground floor of the large building behind the hospital. The kitchen is a light room 15 feet long by 14 feet 6 inches broad, and contains three boilers, two fire-places, and ovens, the latter liable to get out of repair. Wood is used for fuel. The cooking arrangements are, however, said to be sufficient.

*Hospital Linen.*—There is no wash-house for hospital linen. It is washed by contract away from the hospital. The present arrangements are sufficient.

*Storage.*—All the stores have been lately consolidated, and the present store accommodation is said to be ample.

*Accommodation for Hospital Serjeants and Orderlies.*—In describing the general plan of the hospital, we have stated that the arches at each end of the building are divided into three separate rooms on each floor. There are thus 15 of these small rooms. Two of them on each floor are used as hospital serjeants' quarters, two others are used as regimental surgeries, and the others as small wards, &c. There is no accommodation for orderlies, all of whom sleep in the wards with sick.

There are no ward sculleries, and there are no rooms from which the hospital serjeants or orderly on duty can see the entrances to the wards.

The accommodation for orderlies could be obtained as follows:—

One of the small rooms nearest the back of the building at each end should be fitted up as a ward scullery, with hot and cold water, sink, &c., and made accessible from the verandah and terrace proposed to be erected behind. There would thus be four ward sculleries, one at each end of each floor. Four rooms in the wings, two above and two below, nearest the main body of the hospital at present used as ward-master's office, stores, &c., should be set apart for hospital serjeants. There would be thus four hospital serjeants' rooms, one at each end of each floor, overlooking all the ward entrances. The present four rooms used as hospital serjeants' quarters would then be available for other purposes. If properly ventilated, each would hold three orderlies, and thus some of the accommodation required for orderlies would be obtained. The remainder of the orderlies might very well be accommodated in the wings, and whatever accommodation for displaced stores might be required could be otherwise obtained.

## Fort Neuf.

We shall next describe the barrack accommodation at Fort Neuf.

Fort Neuf is situated immediately to the north of the town of Corfu, and forms an important part of its land defences. It is a very irregular work, occupying the summit and sides of a rocky limestone hill, rising directly from the sea to a height of 186 feet. The area of ground within the defences is 43 acres 9 perches. None of it, except the summit of the rock, presents any level surface, and the principal barrack is built on a narrow ledge of rock about 26 feet above the level of the sea, chiefly formed by scarping the rock behind. A small bomb-proof barrack occupies the flat summit of the rock, and there are several huts in bastions used as temporary accommodation for troops.

The fort is surrounded by nuisances, partly arising from a most offensive form of decomposition, attended by the disengagement of sulphuretted hydrogen gas, produced by the mixture of sewage and salt water already described.

At no great distance to the westward are the public and commissariat slaughtering places, all the blood and offal from which is allowed to pass into the shallow water along shore, giving rise to an intolerable nuisance, and infecting the air to a considerable distance. On the land side of the fort there is a large area of ground occupied by mules and other animals. The surface is a mass of filth, the odour from which is most sickening. It seems as if considerable pains had been taken to accumulate as much filth as possible, on land and water, all round Fort Neuf. It is only a special instance of the general neglect of sanitary precautions for which the whole place is so notorious. We have elsewhere dealt with this matter, and recur to it here only in its connexion with the sanitary state of the barracks.

### 4.—Lower Barrack Fort Neuf.

Lower Fort Neuf barrack consists of a single block of building, four floors in height, situated on the north side of the rock. The front of the barrack faces nearly north towards the sea, at a height of 26 feet above its level, and receives the full benefit of all the cool winds. On the south side it is close to the scarped rock, and there is, on this account, no possibility of free circulation of air through the building, except during winds.

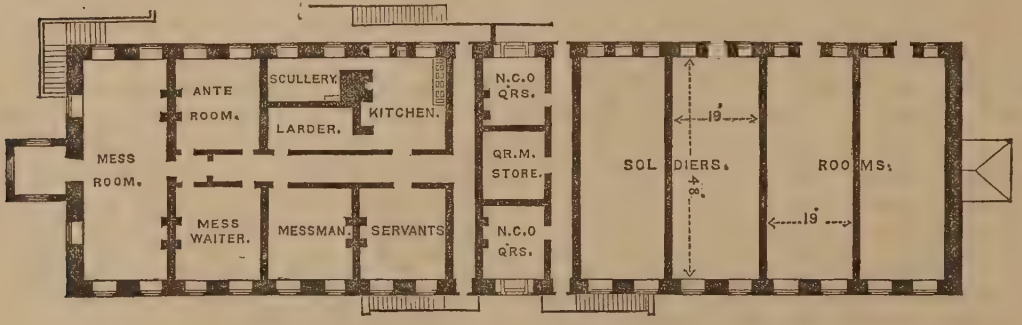
The lower floor is used as stores, canteen, &c. The three upper floors are partly used as officers' quarters, mess establishment, and stores, and they are partly divided into barrack rooms. There is a narrow parade ground between the lower story and the sea wall. A double outside stair rises from this ground to the first floor of the barrack, through which there are two passages leading to a narrow area behind, giving access to the officers' quarters and barrack rooms. The stories above are reached by outside stairs and verandahs behind, partly supported by the rock. All the rooms go through and through the building from back to front, and have windows and the door at opposite ends, the beds being arranged along the dead walls.

Each barrack room is 19 feet broad between the opposite walls, and 48 feet long between the opposite windows, of which there are two, opening to the north and overlooking the sea, and there are two windows, with the door between them, facing the rock. The construction is not a favourable one for ventilation.

Fig. 25 gives a plan of the basement, showing the position of the rock, and also of the first floor, showing the arrangement of the officers' quarters and men's rooms.

Figure 25.—Plan of Lower Fort Neuf Barracks, Corfu.

First Floor.




Basement.

There are 12 barrack rooms and six non-commissioned officers' rooms, with regulation space for 270 non-commissioned officers and men. The details are given in the following Table :—

| Number of Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men per Room at 600 Cubic Feet each. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | No. | Height. | Width. |
| | | ft. | ft. | ft. in. | | | | | ft. in. | ft. |
| 35 to 38, 4 rooms | 24 | 48 | 19 | 13 0 | 494 | 38 | 19 | 4 | 8 0 | 4 |
| 41 to 44, 4 rooms | 22 | 48 | 19 | 12 0 | 497 | 41 | 18 | 4 | 7 0 | 4 |
| 47 to 50, 4 rooms | 20 | 48 | 19 | 11 0 | 501 | 45 | 16 | 4 | 6 0 | 4 |
| Non commissioned Officers' rooms, 32 and 33 | — | 15 | 14 | 13 0 | 2,730 | 210 | — | 1 | 8 0 | 4 |
| Do. 39 and 40 | — | 15 | 14 | 12 0 | 2,520 | 210 | — | 1 | 7 0 | 4 |
| Do. 45 and 46 | — | 15 | 14 | 11 0 | 2,310 | 210 | — | 1 | 6 0 | 4 |
| Total - | 264 | — | — | — | — | — | 212 | — | — | — |
| Guard Room - | — | 23 | 15 | 12 0 | — | — | — | 2 | 6 6 | 3 |
| 3 Cells - - | — | 15 | 6 | 9 3 | 832 | — | — | — | — | — |
| 1 do. - - | — | 15 | 12 | 9 3 | 1,664 | — | — | — | — | — |

*Overcrowding.*—We have in the preceding table given the regulation number of men, and also the number of men the barrack rooms would hold, at a little more than 600 cubic feet per man; but the regulation number does not represent the real number of men crowded into the rooms. On a late occasion there were no fewer than 30 men in each room. It will be seen that four men of the regulation number require to be removed out of each room, or 48 men in all. This measure would reduce the regulation accommodation in the soldiers' rooms from 264 to 212 men, which is the largest number they ought to contain, and on no account should the number be permitted to exceed this.

*Ventilation.*—This is effected only by doors and windows, when open, and by a few openings in the walls. There are no fire-places. The means are insufficient, and the structure and position of the barrack render it very difficult to insure good ventilation. We propose to introduce large shafts of the dimensions and construction described in Part I. of this report, carried from the ceiling of each room up the division wall, at an equal distance from each end of the room above the roof of the building, and also inlets for fresh air at each end of the room, close to the ceiling. Each room should also have a fire-place with a ventilating fire-grate. This is all that can be done to remedy the evil.

*Ablution and Bath Rooms.*—There is an ablution room 15 feet by 18 feet, in the ground floor of a range of buildings at the west end of the barracks. Water is laid on to the ablution table from the town supply, and there are the ordinary moveable basins and a drain to the sea. The place was soaked with water when we saw it, apparently because the men had to make it answer the purpose of a bath room, although there is no bath. It is too small and confined, and being under a room above, it is not sufficiently ventilated, and always damp. The adoption of fixed ablution basins and two freshwater baths in a separate room would remedy much of the present deficiency in the ablution accommodation. The room above the ablution room ought not to be inhabited.

*Cook-house.*—The cook-house is a detached building with windows and doors on all sides. It contains 10 boilers of the old construction, and is ventilated through the roof. Water is obtained from a tap close at hand, and there is a drain to the sea. There is no oven, but the men are allowed the use of a commissariat bakery for baking their dinners. Improved steel boilers and ovens (Plan XVIII.) should be provided.

*Women's Wash-house.*—This is a brick building of an irregular shape, having three fire-places and a boiler. There are no other conveniences. As there are no married quarters sufficiently near to make this wash-house of much use, it might be used as a bath room, and a wash-house might be provided where it is more required.

*Latrines, Urinals, Drainage.*—The latrines have troughs drained to the sea and washed out once in 24 hours. They are all offensive. One of them, indeed, taints the air to a considerable distance. They require to be reconstructed on Macfarlane's or Jennings' principle, supplied with water, and provided with divisions, doors, light, and ventilation.

The *Urinals* also require reconstruction on the principle shown in Plans XIII. and XIV. The present urinals are very offensive.

*Drainage* is partly effected by connexion with the town sewers and partly by direct outlets to the sea. The drains are of brick and stone. Their chief defect is in the outlets, which require to be improved in the manner elsewhere described.

*Workshops.*—There are tailors' and shoemakers' shops on the upper floor of the building containing the ablution room. They require roof ventilation. The tailors' shop has no cutting-out room.

*Schools.*—The school accommodation consists of an adult and infant school. The former is over the guard room, and has some ventilation, but not enough. It requires an additional louvre. The infant school is very small, and requires ventilation. There is a schoolmaster's quarter, without a kitchen.

The sanitary defects of Lower Fort Neuf barracks are as follow:—Bad local position defective construction, nuisances, overcrowding, defective ventilation, bad latrines and urinals, and insufficient means of cleanliness and of cooking. The first two cannot be remedied, but all the others can be dealt with, and were this done the barrack would be a very different place from what it is at present. We feel bound to state that at the time we saw it every part was scrupulously clean, and that the most was made of the means of personal cleanliness at the disposal of the regiment.

*Water Port Guard Room.*—This guard room belongs to the Ionian Government, and is usually occupied by a guard from Fort Neuf. It is situated at a short distance from the sea shore, close to the market and custom-house, in one of the most filthy and neglected localities of the town. It is surrounded by broken pavement, filthy drains, and other abominations. The buildings are very defective, and require thorough repair, and to be made healthy. The troops in them are employed on services useful only to the Ionian Government, all of whose guard rooms, which we have seen, are kept in the same bad state.

### 5.—Upper Fort Neuf (Bell) Barrack.

This is a recently-constructed bomb-proof barrack, situated on the summit of the rock. It consists of a centre, occupied as officers' quarters, and of two wings bent backwards at obtuse angles from the line of the front; enclosing a narrow court-yard between the barracks and the works. There is a small parade-ground facing the buildings. There are a number of huts in different parts of the work used as married quarters, and for other purposes, but the chief part of the accommodation is in the bomb-proof building.

There are two floors of barrack rooms running through and through the building. Those on the lower floor are entered each by its own door, which has a loophole on either side and a small square opening, recently added, above. At the far end of these casemates are three loopholes, but no windows.

The upper floor casemates are reached by stairs in the angles, and the barrack rooms open into each other. These rooms have a window corresponding to the doors of the casemates of the lower floor. They have also loopholes like the lower casemates.

*Accommodation.*—There are nine casemates occupied as barrack rooms. They are with one exception 32 feet in length (the exceptional one is 33 feet long). They are all 18 feet broad. They vary in height of wall from 6 feet 6 inches to 7 feet 4 inches, and their height to the top of the arch is from 11 feet to 12 feet. Four rooms have regulation space for 20 men each, at 283 cubic feet per man. Five rooms have regulation space for 16 men each, at 360 cubic feet per man.

This would give the total regulation accommodation as 160 men.

With proper ventilation there would be space for 9 men per room, and this barrack should have its regulation number reduced from 160 to 81 men. At present it is very much overcrowded, and not an unlikely place to predispose men to fever and other diseases notwithstanding its elevated position.

*Ventilation.*—None, except the doors and loopholes, with the small opening over the door. There is no provision in the construction by which the rooms could be ventilated except by wall openings. There should be windows where they can be substituted for the present loopholes, or if this cannot be done for reasons connected with defence, each loophole should be enlarged as far as practicable and supplied with temporary window frames with glass to be protected by loopholed shutters of iron. A louvred opening should also be made close to the crown of the arch, in the end of the casemate opposite the opening over the door. That is, *each end* of the casemate should have a louvred ventilating opening as near as possible to the crown of the arch.

*Ablution and Bath Accommodation.*—There is an ablution shed with a water supply, but no bath. One bath with water laid on is required. Water should also be laid on to the ablution table and the accommodation generally improved.

*Cook-house.*—This is in a casemate, and is provided with four boilers of the ordinary pattern. There is no oven. The improved steel boilers and a steel oven should be provided.

*Latrines, Urinals, Drainage.*—The latrine accommodation is very defective and noisome. There is drainage to the sea, but the construction is otherwise defective. Macfarlane's or Jennings' latrines well supplied with water would remedy the evil. The urinal is of porous stone, with a horizontal broad trough. It requires reconstruction and water for cleansing.

Upper Fort Neuf cannot be considered as a complete barrack. It is rather a part of the defences intended to be occupied when necessary. But in the scarcity of barrack accommodation it has been made to answer the purpose, like the old ruinous wooden huts in the neighbourhood, without much regard to considerations of health. Viewed in this light, the only good point about it is its elevated position and free external ventilation, but for all this it ought not to hold above one-half of the regulation number of men, and it ought to be improved in the points we have indicated.

*Fort Abraham.*

Fort Abraham is situated a short distance westward of Fort Neuf, from which it is separated by a deep valley. The sites of both forts rise nearly to the same height, but the works of Fort Abraham are lower than those of Fort Neuf. At the time of our inspection Fort Abraham was undergoing reconstruction. It had not been occupied for a long time, and had been falling to decay. One large stone building at its eastern end used to be occupied as a prison, and when we were there it afforded the only barrack accommodation except some wooden huts, erected in consequence of the strength to which the garrison had been raised having exceeded the possible barrack accommodation elsewhere.

The question of health, so far as regards this fort, resolves itself rather into providing healthy accommodation for its future garrison than into improving the present barracks. And this view of the subject is the more necessary, as we found that two large underground arches which had been thrown over one of the old ditches were proposed to be told off as barrack rooms. They would be useful as bomb proofs for sheltering men in case of siege, but they are totally unfit for barrack accommodation. We are under the necessity of objecting to the proposed plan, and are of opinion that whatever number of men are to be placed in the fort to garrison it in time of peace should have barrack rooms built for them. But as the whole area of the place is under 40 acres, the space available for building is very limited.

6. Fort Abraham Barrack.

The present barrack accommodation, such as it is, consists of one large room with an open roof 61 feet long, 40 feet wide, and 14 feet 8 inches high, forming the upper floor of the stone building referred to. This room has been allotted to 56 men at 639 cubic feet per man; but on account of the height of the room each man has only 43 square feet. There are three windows three feet six inches high, by three feet wide, along one of the sides, and two windows five feet high by three feet six inches wide on one of the adjacent sides. None of the windows opened at the top at the time we were there, and the only dependence for ventilation was on the open roof.

This room would be much improved by opening windows on the other sides, and an additional story might be raised on the present walls to extend the accommodation. The open roof besides renders the place very cold and uncomfortable in winter. There is suitable space for increasing the accommodation by properly built huts, but not to any very great extent.

The officers' quarters are under the men's room and are very bad. Under these again are some quarters of a still worse description, occupied by married families.

There was no proper drainage. The latrines were connected with a most offensive cesspit; but we were informed that improved latrines were about to be constructed. All refuse is thrown over the wall of the fort, and there is a Jews' burial ground on the sloping ground outside. There was no ablution room, and the cook-house had boilers but no oven.

In carrying out the works the first thing to do is to determine how many men are to be placed in them. Next to extend the barrack accommodation on healthy principles, giving to each man 600 cubic feet, with sufficient ventilation, and fire-places with ventilating grates for winter use.

Suitable accommodation should be provided for officers, non-commissioned officers, and married people, instead of the present bad quarters.

The whole place should be drained to the sea, cesspits abolished, the latrines reconstructed, ablution and bath accommodation provided and water laid on for all purposes from the supply main. The cook-house should have a proper oven and steel boilers, and arrangements should be made for daily removal of barrack refuse.

The guard room was a Crimean wooden hut, which accommodated one non-commissioned officer and six men. A suitable guard room is required, and also a school room. The school room was in a casemate so damp as to be uninhabitable in winter.

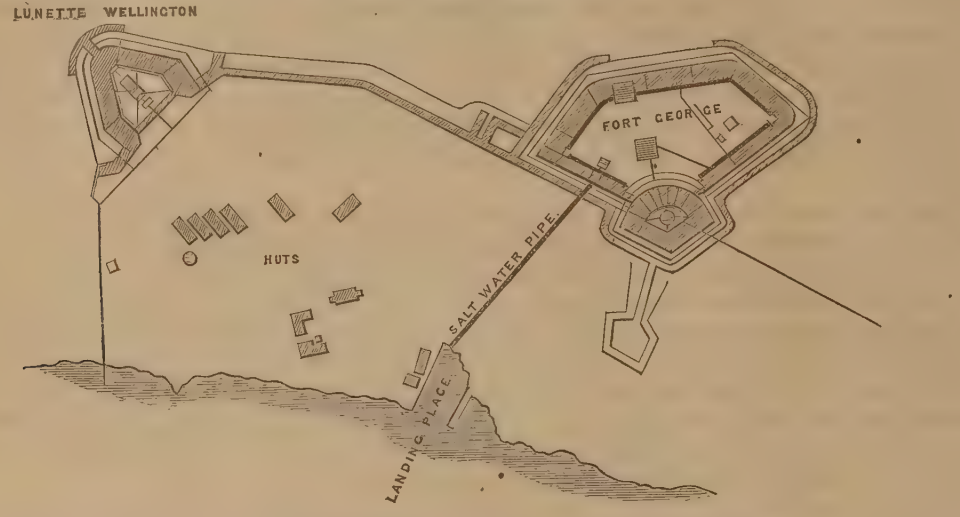
*Vido Barracks.*

There are three sets of barrack rooms in Vido, situated in three separate works, Fort George, Wellington Lunette, and Maitland tower. The two former occupy the highest ground on the south side of the island looking towards Corfu, and are connected by a covered communication about 800 feet long. Maitland tower stands on an isolated eminence overlooking the sea, on the north side of the island.

### 7.—Fort George, Vido.

Fig. 26 shows the general arrangement of the barrack accommodation in Vido in the two principal works, Fort George and Lunette Wellington.

Figure 26.—Vido Barracks.




Fort George is an irregular polygon with a tower at one of the angles. The greatest length of the work is about 600 feet, and its greatest breadth about 200 feet. The barracks and other buildings follow the shape of the work, and leave inside a parade ground of the same form. The whole work is sunk beneath the surrounding levels, so that only the parapet is visible from a distance; and the buildings are separated from the ground by a deep and broad ditch, on the outer side of which there are a number of casemates used for commissariat and purveyor's stores. The tower is similarly constructed. It is surrounded by barrack and other buildings, leaving a narrow deep court in the middle. This form of construction, of course, precludes any free external circulation of air, and renders a much larger amount of space necessary for the men than would otherwise be required for health.

The casemates of Fort George are at present chiefly used as a military prison, and some are occupied as married quarters, canteen, &c. The casemates of the tower are partly used as officers' and soldiers' quarters, partly as artillery stores.

In general character the barrack accommodation does not differ materially from that usually provided in similar works. The rooms have loopholes towards the counterscarp, and windows and doors towards the interior of the works. Some of the rooms in the fort itself are worse than others. Certain of them, occupied as married quarters, have their floors a foot or two below the level of the ground. The rooms in the tower are the best. They have two windows, one on either side the door, and they are entered from open galleries. Connected with the tower is a long casemate out of a counterscarp gallery, with no light or air, except from loopholes low down. It was occupied by men; the air in it was most offensive, and the whole place quite unfit for occupation. Some of the casemates in the fort have no direct ventilation. One barrack room is used as a hospital ward to receive patients until they can be transferred to the general hospital, Corfu.

As a whole, much of the accommodation not occupied as a military prison is of a very bad description, and were it crowded with troops, as is the case generally with the Corfu barracks, a considerable amount of sickness would inevitably be the consequence. Vido used formerly to be considered a very unhealthy station; it is now not so, but it is not fully occupied. The plan on which the barracks have been constructed would fully account for their sanitary state being dependent on the numbers of men in occupation, and what used to be attributed to climate has most probably been due solely to bad overcrowded barrack rooms.

The accommodation in the barrack part and military prison of Fort George is as follows:—

| Barrack Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Number of Men at 600 Cubic Feet per Man. | Superficial Area per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| | | ft. in. | ft. in. | ft. in. | | | | ft. in. | ft. in. |
| Nos. 1 to 6, 6 rooms - | No regulation | 23 0 | 18 0 | 12 0 | 8 | — | 2<br>3 loop-holes. | 4 0<br>1 0 | 5 6<br>1 0 |
| Nos. 7 to 12, 6 rooms - | No regulation | 28 0 | 18 0 | 10 6 | 8 | — | 2<br>3 loop-holes. | 4 0<br>1 0 | 5 6<br>1 0 |
| Guard room - - | — | 19 0 | 16 0 | 17 3 | — | — | — | — | — |
| *Military Prison.* | | | | | Cubic Feet per Man. | | | | |
| 20 Hard labour cells - | 1 | 14 10 | 6 6 | 10 0 | 965 | 96 | none. | — | — |
| 18 Solitary cells - | 1 | 13 6 | 6 6 | 7 3 | 636 | 88 | 1 | 0 10 | 1 8 |
| 3 Cells - - - | 3 | 14 10 | 10 3 | 10 0 | 507 | 51 | none. | — | — |

*Overcrowding.*—There appears to be no regulation as to the number of men per room in these barracks, and the occupation appears to depend very much on the number of men sent to Vido for rifle practice. The allotment has varied at different periods from 16 to as many as 26 men per room, in a space barely sufficient for eight men. The barrack rooms have at times held 312 men in space barely sufficient for 96. From the peculiar structure of the work, such overcrowding should be studiously avoided. Better place the men under tents, if necessary, than crowd them into these rooms. The galleries and the casemates now used for married people should be struck off the accommodation altogether, and never used as barrack rooms except during a siege. They are quite unfit for ordinary habitation.

*Ventilation.*—No provision has been made for fresh air in the construction, and it will be very difficult to ventilate the rooms properly. The best way to do this would be to carry up a shaft from the top of the arch at the end opposite the door to above the parapet, as in Plan XI., Fig. 3, and to provide a louvred inlet for fresh air close to the crown of the arch over the door. If this cannot be done, there should be properly louvred openings at each end of the casemate, through the front and back wall, close to the crown of the arch.

*Ablution and Bath Accommodation.*—None. It is stated that the men wash outside their barrack rooms, or wherever they can, and bathe in the sea. A temporary substitute for an ablution room is formed out of an old gallery by placing in it a barrack table with basins but water is not laid on; and there is no drainage to carry off the water which has been used.

*Cook-house.*—There are two cooking places; one is in a casemate, and very hot. It is provided with four boilers and an oven. The other is a shed in the ditch, used in consequence of overcrowding of the barracks. Improved steel boilers should be provided.

*Women's Wash-houses.*—None.

*Latrines, Urinals, Drainage.*—The latrines are situated in a casemate, lighted by loopholes. They have troughs supplied with salt water by means of a tank filled from a force pump at the sea side, worked by prisoners. There is a latrine for women at the foot of the staircase of the tower. Both are very offensive and taint the air to some distance. They should be re-constructed on Jennings' or Macfarlane's plan, and supplied with water.

The drainage outlet from the men's latrines is partly into a small creek used as a landing-place, close to the point whence the salt water for flushing is taken. The outlet for the Tower drainage is into another small creek called St. George's Bay, about 130 yards from the tower. The former of these outlets is extremely offensive at times. The use of shallow bays or creeks of this kind for drainage outlets into a sea without tides is most objectionable. In the present case the outlet should be removed away from the landing-place to the open water, and carried out to a sufficient depth to prevent nuisance.

There is ample fall to enable any improvement required in the drainage to be carried out.

The court-yard of the tower requires to be flagged and channelled to improve its surface drainage.

There appears to be no urinal in this barrack. One is required, and it should have water provided near it for frequent cleansing.

*Water Supply.*—Fresh water is obtained from three tanks in the fort and one in the

tower, which are supplied by collecting the rainfall from the works. It is not laid on for use, but has to be raised by pumps.

*Married Quarters.*—None, except casemates and galleries, affording a very inferior and insufficient kind of accommodation.

*The School Room* is in a dark casemate.

*Guard Room.*—This consists of two very close casemates. There is no cell nor lock-up attached to it The guard room and school both require more ventilation.

*Military Prison, Fort George.*

This establishment consists of 41 cells, the dimensions of which are given in the preceding table. They are entered from galleries occupying about two-thirds of the circumference of Fort George. The galleries face towards the ditch, and receive a very insufficient amount of light and air from loopholes. The cells are casemates divided, facing towards the interior of the fort, with which they communicate by means of small ventilating openings through 18 feet of solid masonry. The consequence is that the ventilation is imperfect. The whole place was very clean when we saw it, and appeared to be well managed, but it is certainly a very necessary improvement to allow more fresh air to enter the cells, especially to the refractory cell. There is a stove in the passage for warming in winter, but it does not supply fresh warm air. It only warms the comparatively impure air of the interior. A simple stove constructed to warm a supply of fresh air drawn from without should be substituted for the present one.

There are certain obvious defects arising from the nature of the structure.. In many of the cells the division between the prisoners is defective, and they can talk to each other. The infirmary cells are not fit for sick. The cell doors have iron gratings.

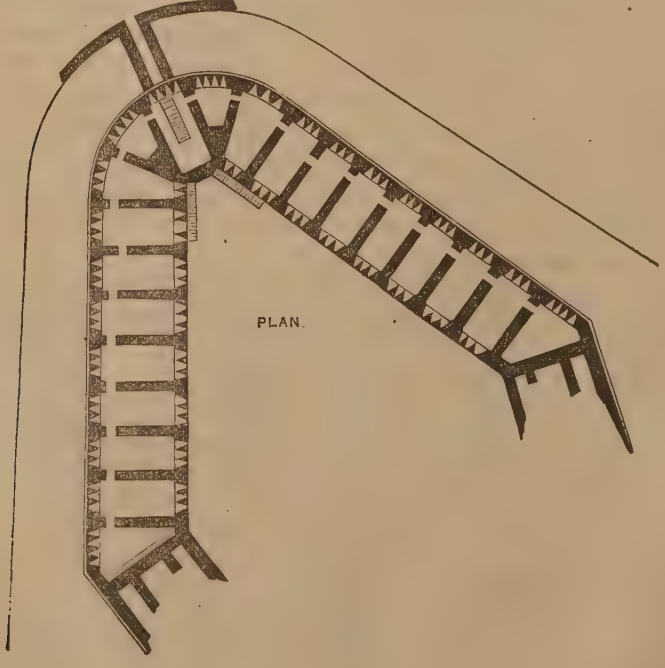
Improved ventilating and warming arrangements should be carried out, but the nature of the work renders structural alterations of any extent impracticable.

8.—Lunette Barracks, Vido.

The barrack accommodation in this work consists of a number of casemates on one floor, built in four out of the five sides of which the work consists. Part of it is occupied by officers, and the remainder by rank and file. The men's barracks are in two rows of casemates, built in the projecting angle of the work. One end of the casemates faces to the court and the other to the ditch. The court face has in the majority of cases a door and two loopholes, but one or two casemates have no outer door, being merely entered from other casemates. The end towards the ditch has three, and in a few instances four loopholes, which afford very insufficient light to the interior. All the rooms communicate by doors in the piers, at the end furthest from the entrance to the casemate.

The nature of this work will be better understood by reference to the following Fig. 27.

Figure 27.—Ground Plan of the Lunette Barracks.



There are in all 14 men's rooms, and the following Table gives the statistics of the accommodation :—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Windows per Room. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | No. | Height. | Width. |
| | | ft. in. | ft. | ft. in. | | | | ft. in. | ft. in. |
| No. 1 | 4 | 31 6 | 14 | 8 6 | 1,150 | 110 | 3 | 1 0 | 1 0 |
| 13 | 10 | 31 6 | 14 | 8 6 | 460 | 44 | 2 | 6 6 | 4 3* |

* These dimensions apparently include the splay, as the openings are only tall loopholes.

*Overcrowding.*—The 13 rooms in the table, with 10 men each, ought not to contain more than seven men per room, which would give somewhat more than 600 cubic feet per man.

*Ventilation.*—Each casemate has a shaft a foot in diameter, carried up through the crown of the arch at the end nearest the door, where it is not required, and an inlet at each end, close to the soffit of the arch. Some of the casemates have an opening only at one end. There should be an opening a foot square at each end of each casemate, properly louvred to throw the air upwards towards the roof. The upcast shaft should be improved by having louvres at the top on Muir's principle, Fig. 19, to keep out the rain, and to obtain the benefit of external air currents in ventilating the rooms. The doors between the casemates at the further ends are injurious to ventilation rather than otherwise, and should be closed.

*Ablution and Bath Accommodation.*—None.

*Cook-house.*—There is a cook-house in the casemate next the salient. It has six boilers, but no oven. The door is small. There should be an opening above the door for ventilation.

*Women's Wash-house.*—None.

*Latrines, Urinals, and Drainage.*—There is no latrine within the Lunette, but there is a urinal. The latrine is situated outside the works, and is drained by a small branch to the main drain, which is carried down the slope to the sea. The ditch and urinal are drained to the same main. The urinal should be supplied with water.

*Water Supply.*—This is obtained from a tank in the middle of the work, to which the rainfall from the roofs is led by pipes. Water is not laid on for any purpose.

*Barrack Huts.*—Between Fort George, the Lunette, and the sea, five brick huts have been built to extend the barrack accommodation. They are erected on sloping ground. The lower end of the hut is sufficiently raised above the level for ventilation beneath, but the upper ends of one or two huts are scarcely raised enough. The drainage of the higher part of the ground requires to be carefully cut off from the site. Each hut is 60 feet long, 17 feet wide, and 9 feet high, and has eight windows 3 feet square placed on opposite sides. There is no regulation as to the number of men, but we have been informed that the huts were intended for 40 men each, which would have afforded no more than 229½ cubic feet per man. They have been occupied by 28 men, which would give about 328 cubic feet per man. They would hold with safety 16 men each, which is the number that ought to be placed on the door.

The huts have louvres in the roof for ventilation, but those we saw were closed up, showing some imperfection in the construction. The louvre in such a climate as Corfu should admit of regulation during winter.

The huts are too narrow, and the windows are too small; they are, nevertheless, better than most of the barrack accommodation at Corfu, but they want fire-places.

## 9.—Maitland Tower, Vido.

This is an isolated work, situated on a knoll over-looking the sea. The barrack accommodation consists of a large circular room, 19 feet 10 inches in diameter, and 11 feet high, occupying the middle of the tower, and of four cross rooms, each 16 feet long, 14 feet wide, and 9 feet 3 inches high, extending from the circle. Each room has a window 5 feet high and 3 feet wide, and there is a shaft carried up from the ceiling of the circular room to the platform above.

There is no regulation as to the number of men, but the usual complement is 28 men, at 450 cubic feet per man. There is space for 21 men, but for no more. In so small a barrack, by taking advantage of the central shaft, the ventilation would be sufficient if one of the top panes of each window were replaced by a moveable pane, to fall inwards, like Sherringham's ventilator.

There is no ablution room, and no oven in the cook-house. There is a disused watercloset, and a latrine outside.

Some ablution accommodation is indispensable. The cooking arrangements should be improved, and also the latrine.

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## II.—PAXO.

### 1.—Topography and Climate.

Paxo is a small island about 9 miles in length and $4\frac{1}{4}$ in breadth, lying about 8 miles south-east of Corfu. It consists of an irregular mass of hard limestone rock, rising 800 to 900 feet out of the sea, with steep or precipitous sides, indented by small bays partly formed by small islands. The surface rises irregularly into heights separated from each other by shallow ravines. There is very little soil, except in the ravines, and the chief vegetation consists of olive trees, which cover almost the entire island, even to the highest points. There is no stagnant water anywhere, and no marshy land, properly so called. There is an area of tolerably level ground of some extent on which the town of Gajo, the capital of the island, is situated. Part of this ground is at or below the level of the sea. It is formed of loose débris, and receives the natural drainage of a considerable part of the island, which flows down the rapid slopes and ravines towards the small bay on which the town is situated. Most of the houses we saw in the interior of the island are built on slopes, without any precautions for protecting them from drainage from above. They are generally imbedded among trees and heights, with a considerable quantity of decaying vegetable matter around them and among the trees, so that, except in high winds, there always must be a greater or less stagnant, damp, malarious state of the atmosphere. The sites for the town and villages are indeed not such as would be chosen were the object to avoid malarial disease.

The population of the island numbers probably 5,000, about 300 occupying the town of Gajo. The town consists chiefly of detached houses, and has externally a more neat and clean appearance than most other Ionian towns; but, like all of them, it is badly drained. It has no proper water supply, and there is ample room for improved cleansing in and around the houses.

The houses are built along the curve of the bay, which is quayed in front of them, but, as the ground is pervious to water, it is infiltrated by the sea, and the wells are brackish. The town hence stands on ground in which fresh-water drainage from higher levels, and salt-water from the bay, intermingle. The position is convenient for commercial purposes, but it is an unhealthy one, although there is ground within a very short distance which would afford as healthy a site for houses as any in the island.

The whole water supply is derived from rainfall, by surface drainage, or from wells. There are no streams or lakes in the island. During rain the water is conveyed to large underground tanks, one of which, of considerable size, was in process of construction at the time of our visit. Water obtained in this manner is very liable to impurity from organic matter, and it requires thorough filtration before being passed into the tanks.

Among so limited and sparse a population no very extensive works of water supply are required, but a very cursory examination is sufficient to show that, for the town of Gajo at least, both the quantity and the means of distribution could be easily improved.

The only meteorological instrument at the station is a thermometer, by which the following observed mean temperatures have been obtained; but the observations are too incomplete to give any other than approximations to the truth.

FOUR YEARS' OBSERVATIONS, from January 1856 to December 1859.

| Months. | Mean Maximum. | Mean Minimum. | Rain. | Winds. | | Days of Sunshine. | Rainy Days. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | | Direction. | Force. | | | |
| | ° | ° | | | | | | |
| January - - | 57 | 50 | Rainy | S.E. | Moderate | 16 | 10 | Cloudy |
| February - - | 56 | 46 | Do. | S.E. | Do. | 15 | 11 | Do. |
| March - - | 54 | 50 | Do. | S.E. | Do. | 9 | 14 | Do. |
| April - - | 68 | 57 | Do. | S.E. | Do. | 26 | 2 | Clear |
| May - - - | 74 | 61 | Dry | S.W. | Do. | 30 | — | Do. |
| June - - - | 78 | 71 | Do. | N. | Calm | 31 | — | Do. |
| July - - - | 87 | 71 | Do. | N.E. | Do. | 31 | — | Do. |
| August - - | 84 | 70 | Do. | N.E. & S.E. | Do. | 30 | — | Do. |
| September - - | 79 | 72 | Do. | | | | | |
| October - - | 76 | 66 | Rainy | E. | Do. | 30 | — | Do. |
| November - - | 59 | 51 | Do. | S.E. | High | 6 | 18 | Cloudy |
| December - - | 59 | 42 | Do. | S.E. | High | 5 | 20 | Cloudy |

The climate is stated to be good and healthy, dry and warm in summer; but rather cold, very variable and damp in winter.

There is nothing in the climate specially to occasion disease; and yet the native population is said not to be healthy.

### 2.—DISEASES OF NATIVE POPULATION.

There are no statistics to show the prevailing diseases; but from inquiries on the spot, we learned that in Gajo, at least, periodic fevers are more or less prevalent, accompanied with enlargements of the spleen, and that scrofulous diseases exist to some extent. The low damp position of the town, and the state of the drainage and water supply, are quite sufficient to account for the occurrence of such diseases.

### 3.—MORTALITY AND DISEASES OF TROOPS.

The troops stationed at Paxo occupy a small fort which crowns the summit of the island of St. Nicolo, a rock about three miles in circumference, and between 80 and 100 feet high, occupying the middle of the bay, on the shore of which Gajo is situated. This island reduces the bay to a channel about 200 yards wide, and protects the port towards the sea; completely covering the town, which only becomes visible on passing inside the island.

The position is freely exposed to all the healthy winds, and is out of the reach of any sources of malaria, except such as may proceed from the island of Paxo itself.

There were 33 men in garrison at the time of our visit, and there were no sick in hospital. The strength varies in different years. It averaged 41 during the 10 years 1837 to 1846, for which years the mortality is first given in the reports of sickness and mortality in the army (1853). During these years the admissions to hospital averaged 973 per 1,000 strength; and the deaths were 24 per 1,000. Fevers were the cause of 244 admissions per 1,000, and of 17 deaths per 1,000 strength. The most fatal disease was continued fever, the mortality from which was 1 in 11 of the attacks, or about five times the usual proportionate mortality.

A return has been made for us of the diseases among the troops for nine and three-quarter years, from April 1850 to December 31, 1859, from which it appears that the aggregate strength during this period was 350, the admissions to hospital 398, and the deaths three, giving a ratio of about 1,136 per 1,000 strength of admissions, and about 8 per 1,000 deaths. Fevers occasioned 188 or nearly one-half the admissions; and out of the whole number there were only 12 admissions from intermittent and three from remittent; all the others were from continued fever. Two out of the three deaths arose from pulmonary diseases. There was no death from fever.

In the year 1859 there were 37 men in garrison, and there were 37 admissions to hospital, but no deaths.

The strength in 1860 amounted to 33 men; 32 were admitted to hospital, of whom 24 suffered from continued fever. There was not a single case of periodic fever during this year.

We have already referred to the increase of fever at Corfu in 1861, and it may be useful to compare with it, the amount of disease at Paxo during the same period. The strength in this island was 33 and the admissions 33 during the first nine months of the year, but no deaths occured; of these 33 admissions, 21 were from fever. Of the fever cases 11 were intermittent and 10 continued.

The evidence taken as a whole goes to prove that continued fever is the most common

form of febrile disease at Paxo. This is indeed distinctly stated by the medical officer in his report to us; he also states that the cases are slight, and that they are most numerous in June, July, and August. There is little or no disease during the cooler period of the year.

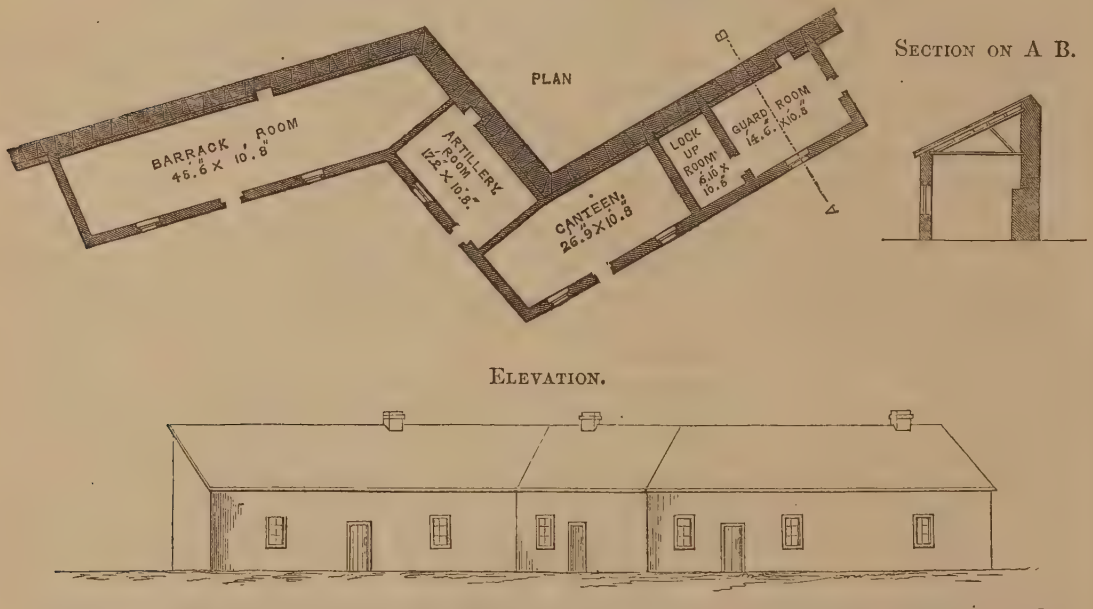
We next proceed to describe the barrack accommodation.

### 4.—Fort St. Nicolo Barracks.

Fort St. Nicolo is an irregularly shaped work defended by a low wall in bad repair on the side next the sea. On the side towards the island the wall is in a better condition, and forms two flanks, between which the gate is situated. The barrack accommodation is a lean-to shed built against this part of the wall. It consists of a school-room, one married quarter, canteen, guard room and lock-up, cook-house, store, and one barrack room for 28 men. This room is 97 feet 11 inches long, 10 feet 8 inches broad, and 11 feet 8 inches high. It is built round the curtain flank, and is very dark. The cubic space per man is 436 feet and the superficial area is 37 feet. The room is overcrowded to the extent of eight men, and should never hold more than 20 men. The only means of lighting are small low windows, the tops of which are only eight feet above the floor, and loopholes through the outer wall, almost always closed. There are no means of ventilation, and no fire-places.

Fig. 28 shows better what the accommodation really is than any verbal description could do.

Figure 28.—Paxo, Plan of the Barrack Buildings.




The accommodation is complained of as being very damp, and the men have to clean their rifles several times a day to prevent rust. This fact, together with overcrowding and absence of ventilation, is an important element in accounting for the fever. The dampness is attributed to deliquescent sand having been used in building and plastering. The rooms have wooden floors without any passage of air beneath, a defect always of serious consequence to health in warm climates.

The accommodation is very uncomfortable; the room is far too narrow, and it does not admit of material improvement. The best thing to do would be to erect a good barrack hut, raised above the ground, with fire-places, ventilation, sufficient window space and verandahs to afford 600 cubic feet per man, for say, 30 men; and any force above this number might be provided for in the present barrack.

In the meantime the room requires ventilation by louvered shafts through the ridge, and inlets along the eaves, additional light, which would be most easily admitted by skylights, and fire-places with ventilating grates. There is no shade for the men during the hot summer weather; and a verandah would be of great service.

*Drainage.*—There are ample facilities for drainage on all sides; but there are no drains except surface drains used for conveying roof and other surface water to the tanks, all fluid refuse from privies, urinal, cook-house, lavatory, &c., is allowed to escape among the rocks down the hill as it best can. With so excellent a fall every drop of refuse water could be removed to a safe distance by a small pipe drain, and the danger of polluting the water supply entirely prevented.

There is a privy away from the barracks, outside the fort wall; it is a mere pit, with ladder seats over it, and an opening for cleansing; all fluid runs down the hill.

This state of the drainage should be considered with reference to another point which has been often a cause of complaint; namely, the want of vegetables at Paxo. Very few are reared on the island; and the men suffer from the absence of this important element in wholesome diet. There is a small area of land at the foot of the hill on which the men would gladly cultivate vegetables if the land were rented for them. We are of opinon that this should be done, not only for the reason stated, but because the whole drainage of the barrack could be most advantageously used for manuring the ground, a process which would render the sewage entirely innocuous; and the men would find something to occupy them in a place where at present they have nothing to do, except their guard duties.

The levels are so favourable, that all the ablution and other refuse water could be conveyed to a Macfarlane's latrine of three seats, in which this waste water could be used in default of any other; and the whole could be conveyed down the hill to a tank close to the vegetable garden, and thence distributed on the ground.

*Water Supply.*—There is no source of water available except rainfall collected from the roofs and from the surface of the barrack yard, whence it is conveyed by cemented open drains to sand and gravel filters, through which it is passed into two under-ground tanks, one having a capacity of 6,280 the other of 1,858 gallons. The quality is stated in the return to be pure and good, and the amount sufficient; but supposing the tanks to be full at the beginning of the dry weather, which lasts five months, from May to September inclusive, the whole storage would allow only $1\frac{2}{3}$ gallons a day per man for 33 men, an amount certainly far from being sufficient. Besides this we find from a return of the cost of supplying water to different stations (Appendix 11), that in 1856 the sum of 102*l.* 5*s.* 9*d.* was paid for 6,428 barrels of water carried up to the fort during the year; a sum equivalent to a water-rate of about three guineas per man.

This would represent a capital quite sufficient, to say the least of it, to provide a sufficient water-supply for the garrison for all purposes, including water latrines and drainage. The only way to do this would be by additional tanks or by a well.

There is one point as regards the manner of collecting the water which requires improvement. At present the whole of it is conveyed to the tanks by open surface drains liable to pollution. All the roof water, at least, could be conveyed to one of the tanks direct by pipes, and used for drinking and cooking. The water collected from the surface of the barrack yard could be conveyed to the other tank, and might be used with safety for all other purposes.

*Ablution and Bath Accommodation.*—There is an ablution shed with a stone bench outside the fort wall, and water has to be carried to it from the tank inside the fort. This accommodation should be improved and placed nearer the men's rooms. The refuse water, instead of being thrown about as at present, should be disposed of in the manner already mentioned. There is no bath; the men bathe in the sea. One bath at the sea shore, where the men could wash themselves thoroughly with marine soap and salt water, would be the best arrangement here, on account of the deficiency of fresh water.

*Cook-house.*—The cook-house is in the same line as the soldiers' quarters. It has two rectangular boilers and an oven, but the allowance of wood, 2 lbs. per man, is said to be insufficient for cooking. It would be enough if steel boilers and an oven were provided. The cook-house itself requires ridge ventilation.

*Guard Room.*—The guard room is intended to accommodate a corporal and three privates. It was used as a married quarter when we saw it. It requires ventilation, like the other parts of the building.

The history of this small detachment barrack shows that notwithstanding its elevated and healthy position it has not escaped the diseases of larger and less favourably situated stations. The sanitary defects we have enumerated are quite sufficient to account for this fact, and if they be removed in the manner we have pointed out, there will be improved health among the troops.

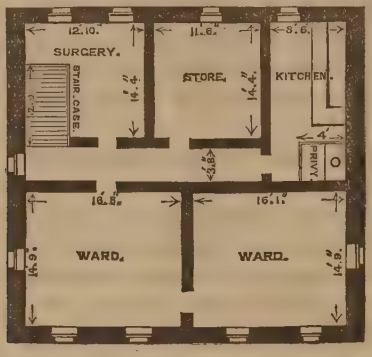
There are no officers' quarters in the fort. The officer commanding and medical officer are quartered in the town, in by no means so good a position as the fort.

### 5.—Hospital, Paxo.

The hospital, a plan of which is given in Fig. 29, is a hired house on the quay at Gajo, exposed to the same local conditions with regard to drainage and water supply as the other houses in the town. The only favourable points about it are, that the sea breeze

blows into the windows, that the house is three floors in height, and that the sick occupy the uppermost floor. Below the wards are the medical officer's quarter, occupying the first floor. The ground floor on the level of the quay is unoccupied, and so damp that there is no difficulty in understanding how people who live on these ground floors suffer from malarial disease.

Figure 29.—Plan of Hospital, Paxo.




The following is the accommodation :—

| Wards. | Regulation Number of Beds per Ward. | Dimensions of Wards. | | | Cubic Feet per Bed. | Superficial Feet per Bed. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| | | ft. | ft. | ft. | | | | ft. | ft. in. |
| 1 | 4 | 17 | 15 | 9 | 574 | 64 | 3 | 4 | 2 10 |
| 2 | 4 | 16 | 15 | 9 | 540 | 60 | 3 | 4 | 2 10 |

If the wards were occupied up to the regulation, which fortunately they are not, the overcrowding would be excessive. The rooms should hold no more than two beds each. With this small number of beds the ventilation by windows would be sufficient.

On the same floor as the wards, but separated from them by a passage, is the surgery, a store, and a small kitchen. In the corner of the kitchen is the privy, which is simply an open pipe descending within the house to a drain in the basement, up which the sea washes ; forming altogether a very dangerous contrivance to have within a hospital. It is stated not to be used by the sick, if this be the case the privy should be removed altogether. If it is to be used it ought to be made into a watercloset, properly lighted and ventilated, and boxed off from the kitchen.

There is neither lavatory nor bath, only basins brought into the ward, and a foot-pan. There is no place for convalescents taking exercise except along the quay in front.

This hospital is simply a private house and nothing more. Its best recommendation is that it is not much used, but as a rent must be paid for it and as the position and accommodation are not good, a small hospital hut with all conveniences for the average number of beds occupied, similar to that shown in Plan XX., should be erected within the fort, which would be on every account a better and more convenient locality.

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## III.—SANTA MAURA.

### 1.—Topography and Climate.

This island was at one time a peninsula, connected with the coast of Greece by a narrow low neck of land, cut across in ancient times to allow of small vessels passing between the island and the mainland without incurring the hazards of the tempestuous sea along the west coast. The island is about 30 miles in length by four in breadth. It runs nearly parallel with the main land of Greece, leaving a channel of varying breadth between the mountains of the two opposite coasts, terminating at its north end in a shallow strip of water, three miles in length, and varying in breadth from 100 yards to a mile and a half, almost enclosed at its northern end by low narrow spits of land, and forming the lagoon of Santa Maura.

The island is simply a mountain ridge of limestone, rising in some places to about 3,000 feet above the level of the sea, with lateral spurs, between which are several valleys,

opening to the east and south. Along the whole of its western and northern sides the island is precipitous, and at some points presents lofty white escarpments, from which its ancient name was derived.

The interior of the island is mountainous, with here and there small lakes and patches of marshy ground, the emanations from which affect the general health of the population at certain seasons.

Agriculture is still in a rude state, and the absence of drainage exercises an injurious effect on health.

That part of the island with which we have chiefly to do is the northern extremity, where the lagoon joins the sea. At the point of junction, but in reality more connected with the coast of Greece than with the island, was constructed on a spit of land the mediæval fort and church of Santa Maura, formerly the residence of the Venetian Government, and now the military station of the island. Its distance is a little more than a mile from Amaxechi, the present capital of the island: formerly a small sea side port, for the convenience of trade between the island and Santa Maura, the real capital. Out of this combination of circumstances it has arisen that a considerable part of the population of the island has become clustered at its northern extremity on one of the most unhealthy tracts of country to be found in the east.

The unhealthiness is partly due to local position, partly to absence of proper sanitary works. The local health authorities with whom we communicated appeared to be perfectly aware of the causes of the unhealthiness, and also of the class of improvements required to mitigate them; but hitherto little or nothing appears to have been done to improve the town.

We shall describe briefly the present defects in so far as these have an influence on the general health of the neighbourhood where the troops are quartered, and generally the nature of the improvements required.

At this end of the island the mountain chain runs nearly parallel to the western side of the lagoon for a distance of about four miles. The mountain slope is very rapid, and at the foot of it there is a strip of almost flat country from one and a half to two miles in width, only a few feet raised above the level of the water, extending from the foot of the slope to the lagoon. From the northmost point of the island a narrow spit of low land, about a mile and a half in length, projects almost due north into the open sea, and is then bent on itself at a right angle towards the east, for a distance of two miles. There is a narrow passage only a few yards wide between the end of this spit and the fort, which occupies another spit of land running north-east towards the coast of Greece. Between the fort and the mainland there is at this point an expanse of shallow fordable water, about a quarter of a mile broad.

These tongues of land enclose the shallow water of the lagoon towards the north, and there are narrow openings at the fort, between the lagoon and the sea, quite insufficient to insure a current through it. Under a hot sun the atmosphere all over becomes charged with moisture, and ready to intensify any sources of malaria existing along the shores.

The relation of the fort to the adjoining sources of malaria is shown in the Plan No. XXXIV.

There is no evidence, however, to show that the water of the lagoon, *per se*, is a source of malaria. The water covers its bed, because there is no tide. But the action of the wind may expose to a greater or less extent the banks about the fort on which there is a mingling together of vegetation and sea water, such as in warm climates is productive of malaria; on the other hand the fort is exposed to every wind from the sea, an advantage which tends to neutralize malaria proceeding from such sources. But the chief sources of malaria are in the low land of the island itself, in the vicinity of Amaxechi. This land consists of a deep rich soil covered with olive trees and other kinds of cultivation, even to the outskirts of the town. It receives the whole of the drainage from the mountain range behind it. Part of this fresh water disappears by evaporation, part escapes by water courses through the subsoil to the lagoon. Much has been done at different periods to relieve this rich soil of its superfluous water by deep trenching and draining, and some of these trenches appear to be used in very dry weather for irrigation; but much yet remains to be done to the westward and north-westward of the town, the direction from which malaria comes with greatest intensity. Even at the end of the dry season some of the trenches contained stagnant green water, giving off a faint sickly odour, at the time we were there.

The health of the district would be much improved by extending this drainage. It should be made a public object to do so, and it would amply repay its cost in improved health and productiveness.

So far as concerns the health of the troops, there can be no doubt that the whole of that part of the island nearest the garrison is unhealthy from malaria, the result of topographical position and insufficient drainage.

*Climate.*—The only meteorological instrument at the station is a thermometer, and the only information we have been able to obtain as to the elements of climate is the following, including the period between July 1856 and April 1860.

| Months. | Thermometer. | | | Number of Rainy Days per Month. |
|---|---|---|---|---|
| | Mean Temperature. | Mean Maximum. | Mean Minimum. | |
| January - - | 51 | 59 | 44 | 7 |
| February - - | 52 | 61 | 44 | 8 |
| March - - | 56 | 65 | 47 | 7 |
| April - - - | 64 | 71 | 53 | 4 |
| May - - - | 67 | 75 | 62 | 5 |
| June - - - | 72 | 78 | 59 | 4 |
| July - - - | 79 | 86 | 72 | 1 |
| August - - | 80 | 88 | 72 | 3 |
| September - - | 73 | 82 | 65 | 4 |
| October - - | 72 | 82 | 63 | 5 |
| November - - | 64 | 74 | 55 | 8 |
| December - - | 55 | 66 | 47 | 8 |

Imperfect as these dates are they show great diurnal variability, attributable to the local position of the fort, which is exposed to the hot moist winds coming up the lagoon from the south-east, and the cooler sea breezes from the north and north-west. Besides this, the neighbouring coasts of Greece and Albania are very mountainous, and are the source of cold winds, especially in winter. The summer is hot, the winter very variable, but the climate, *per se*, apart from malaria is found to be healthy. Fever and diarrhœa are said to be the prevalent diseases of the summer months.

## 2.—Diseases of Native Population.

Appendix 12 contains a table of the population and mortality of the island for a period of five years, and also the admissions and deaths into the civil hospital at Amaxechi for the same period.

This return gives the average population of the island at about 20,500, and the average annual deaths for five years at 388·8, or less than 19 per 1,000 per annum.

The most prevalent fatal diseases are stated to be remittent and intermittent fevers, inflammation of the chest and abdomen, tubercles of the lungs, and marasmus in children. The nature of the fatal diseases leads us to suspect that the mortality must be greater than the amount given in the table, that many deaths must be unaccounted for; and that the registration is incomplete.

The hospital table shows that above 34 per cent. of the admissions were due to fevers, about half of which were periodic in character.

## 3.—Sanitary State of Amaxechi.

Amaxechi, situated in latitude 38° 50′ N., longitude 20° 40′ E., is an irregularly built town of about 4,000 inhabitants, with open suburbs extending among the olive trees by which it is enclosed on the land side. The houses are partly of stone, partly of wood, many are on one floor, the remainder are in two floors. It is a miserable looking place, and the inhabitants generally have a pale, sickly, malarial, unhealthy appearance.

The chief diseases to which they are subject are remittent and intermittent fevers, with cases of a typhoid nature. There is much spleen disease; and mesenteric disease is stated to be very prevalent among children.

The sanitary state of the town is nearly as bad as possible. It has no drainage, only open gutters teeming with every abomination passing in front of the houses. When we were there these surface gutters were full of putrid water and filth; the paving bad; the town badly cleansed. There appear to be no latrines, and everything is thrown into the street, and taken away afterwards in a very defective way. The whole aspect of the place is indicative of neglect and backward civilization. The site no doubt is a bad one, and unfavourable for drainage; but it could be drained. It is merely a matter of sanitary engineering. It can also be well paved and properly cleansed, and suitable conveniences provided. Were these improvements carried out the general health of the place would

be materially improved. Notwithstanding the neighbouring sources of malaria, there is nothing in the surrounding country a tenth part so bad as the town itself, and it is here that the evil requires to be grappled with.

The supply of water from ancient springs in the vicinity is unlimited, but it requires to be laid on in connexion with drainage, to be of real benefit to the sanitary state of the town.

Such of the poorer class of houses as we saw are very miserable, the floors of stone, and damp, and the places dark and noisome, to a degree we have rarely seen elsewhere.

We visited the civil hospital, which may be taken as an illustration of the backward state of things in this town. Everywhere hospitals have generally been much in advance, in matters of health and convenience, of the houses of the poor from which they receive their inmates. Bad as these houses are at Amaxechi, we question whether any large proportion of them are in a much worse state than the hospital. It is a cottage looking building, dirty, uncomfortable, without ventilation, without any of the barest means or appliances for treating sick, if we except dirty beds. The only favourable thing about it was that there were only two or three patients in it. As to attendance or administration, there is none; for after knocking some time for admission, the only person we could find to admit us was a slip-shod dirty woman, who appeared to be in charge.

Notwithstanding this neglect, it was stated to us that a considerable sum of money is set apart every year by the Government for the support of the place.

In this as in other towns of these islands some authority is required competent to deal with all questions bearing on the public health, with power and means to improve the sanitary condition of the people.

## 4.—Diseases and Mortality among the Troops.

The mortality among troops serving at this station is given in the Statistical Report at 46 per 1,000 strength per annum for the 20 years from 1817 to 1836. Of this tropical mortality 37·6 per 1,000 was occasioned by various types of fever. Remittent fever is stated to have been the chief source of fever mortality, and to have attacked nearly a third part of the troops annually. In 1828, out of a force of 294, there died 33 men from remittent and 11 from continued fever passing into remittent, the fever mortality in that year amounting to 15 per cent. of the strength. In 1829 the disease again broke out and attacked nearly the entire garrison.

During the 10 years from 1837 to 1846, the average strength was 125, and the mortality was in the ratio of 19·9 per 1,000. The fever mortality was 13·5 per 1,000, chiefly from remittent fever, which in 1837 attacked nearly half the garrison.

A return for 10 years, between April 1st, 1850, and March 31st, 1860, prepared for us by the medical officer in charge. Appendix 13 gives the following results:—

| | |
|---|---|
| Aggregate strength for the period | 1,200 |
| Admissions to hospital | 752 |
| Deaths | 15 |

The average annual mortality for these 10 years was 12·5 per 1,000, and the admissions 625 per 1,000 strength. Of the 752 admissions 213 were from fevers, and of these 113 were intermittent, 30 remittent, and 65 continued fevers; there were also three cases of typhus. Of the 15 deaths two were occasioned by intermittent, four by remittent, two by continued, and two by typhus. The mortality from fevers was two thirds of the total mortality.

The Report of the Army Medical Department for 1859 states the strength for that year at 106, out of which there were 96 admissions to hospital and no deaths.

We learn from the returns prepared by Deputy Inspector-General Dr. Innes, that in 1860 the strength was 112, and the admissions to hospital 82, of which there were four from intermittent fever, two from common continued, and three from typhoid fever. There was only one death during the year and it arose from continued fever.

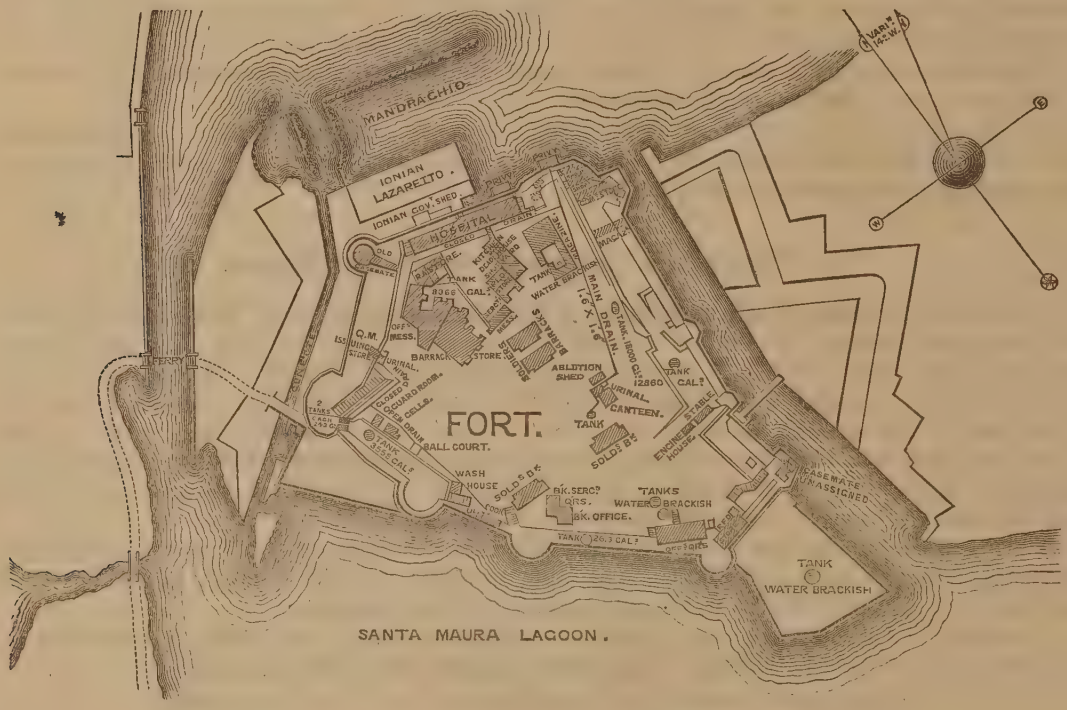
During the first three quarters of 1861 the strength averaged 120; there were 47 admissions, of which four were from intermittent, five from remittent, and one from continued fever. There was one death from tetanus. At the time of our visit there was not a single patient in hospital out of a strength of 132.

These statistics as a whole show a remarkable improvement of late years in the sanitary state of the garrison at Santa Maura; but they also show that fevers of the periodic type constitute the danger of this station, and that sanitary improvements should be mainly directed to removing any local predisposing causes of these diseases which may exist.

## 5. Sanitary State of the Fort and Barracks.

The Fort of Santa Maura, a plan of which is given in Fig. 30, is situated above a mile to the north-east of Amaxechi, and occupies nearly the whole surface of a triangular area of ground, converted into an island by ditches at the point of a spit of low marshy land running along the Greek coast. The island is about 1,100 feet long, and 800 feet wide at its broad end. The fort is triangular in form and consists of curtains with bastions. The area inside the barrack boundary is 22 acres 6 perches. The surface soil is gravel, and the subsoil is described as a species of natural concrete. The fort walls rise directly out of the water, and overtop all the buildings within. Very few of the ancient buildings remain, but among others is the church of Santa Maura, now used as a store. The officers' quarters and barracks are of recent construction, and the hospital appears to be an old building converted to its present purpose.

Figure 30.—Fort of Santa Maura.




On the north is the open sea; on the south and west the shallow water of the Lagoon five or six square miles in area; on the east side close under the fort wall on the spit there is some extent of broken marshy ground with vegetation, as there is also on the neighbouring coast of Greece. There is likewise considerable vegetation in the shallow water itself, close to the walls. The position cannot be said to be a healthy one, for the reasons already given, but it might be improved; at all events its disadvantages admit of being partially compensated for by improvements in other directions. Some improvements have been already made, and since their date there has been a marked diminution of disease and mortality. We allude to the destruction of the old barracks by an earthquake, the erection of the present barracks since 1836, and the great diminution of overcrowding consequent on the reduction of the garrison to less than one half, and of late years to one third of the numbers, which used to be crowded into the bad barracks of the first unhealthy period.

The present barrack accommodation is in five buildings, three of which were constructed in 1832 and two in 1836. These blocks are separated from each other, and face the north to obtain the benefit of the breeze coming from the open sea. They are in two floors; the lower stories built of stone and flagged, on the level of the ground; the upper stories are of wood, and brick noggin, and they have wooden floors. The lower floors are, with one exception, not occupied as barrack rooms, the men being placed on the upper floors, which are reached by verandahs and outside stairs. The ground floor rooms were chiefly used as married quarters. The rooms have windows on opposite sides and at the ends, admitting of free perflation of air when open.

There are six rooms at present used as barrack rooms, affording space by the present regulation for 126 men. The details are as follow:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men at 600 Cubic Feet per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Width. | Height. | | | | Number. | Height. | Width. |
| | | ft. in. | ft. in. | ft. in. | | | | | ft. in. | ft. in. |
| W. Room No. 1 - | 21 | 57 9 | 16 0 | 10 10 | 476 | 44 | 16 | 14 | 2 7 | 2 4 |
| „ „ 2 - | 21 | 57 6 | 15 0 | 8 4 | 345 | 41 | 12 | 10 | 3 8½ | 3 0 |
| X. Room No. 1 - | 21 | 57 6 | 16 0 | 11 1 | 485 | 43 | 16 | 14 | 2 7½ | 2 4 |
| „ „ 2 - | 21 | 57 6 | 15 0 | 7 6 | 308 | 41 | 10 | 10 | 3 2½ | 3 4 |
| U. Room No. 1 - | 21 | 60 6 | 18 3 | 11 6 | 604 | 52 | 21 | 16 | 3 3 | 2 3½ |
| S. Room No. 1 - | 21 | 60 6 | 18 3 | 11 6 | 604 | 52 | 21 | 16 | 3 3 | 2 3½ |
| Total - - | 126 | — | — | — | — | — | 96 | — | — | — |
| Guard Room - | — | 24 0 | 14 0 | 11 6 | — | — | — | 2<br>2 | 3 3<br>2 10 | 4 0 |
| Prison Cells, 5 each - - | — | 13 0 | 7 0 | 7 0 | 637 | 91 | — | 1 | 1 6 | 3 0 |

*Overcrowding.*—The comparatively small amount of surface and cubic space allowed in these barracks for two thirds of the troops, even under the diminished overcrowding of late years, consequent on the great reduction of the force, enables us to understand what must have been the condition of the garrison in the old barracks at a time when it suffered from remittent fever of a more fatal kind than that of the West Indies.

Assuming 600 cubic feet per man as our standard of accommodation, these barracks will hold 96 men and no more. This is not enough for health. There can be no safety for men sleeping on ground floors in such a locality. None but upper floors should be used as quarters, and if lower floors are to be used at all, it should only be as dining and day rooms.

All lower floors should be struck off the barrack accommodation, and if this were done, and 600 cubic feet per man allowed in the other rooms, the troops would be more healthy than they are now.

In low positions, such as that occupied by the fort, where sea water penetrates the subsoil, ground floors are always damp, and in malarious districts the poison is always more intense close to the ground than it is 10 or 12 feet above it.

The sanitary condition of the troops would be further improved by a larger allowance of surface area. In positions not naturally healthy, it is necessary to give more space for the men than they could do with in a more healthy position even close at hand. In the present case the surface area should not be less certainly than 60 to 70 square feet per man. This of course would imply more cubic space than the regulation amount of 600 feet per man.

*Ventilation.*—The window space is sufficient, and this, together with the isolated position of the barrack rooms, constitute the most favourable points of the construction. There are no fire-places, although the winters are cold and variable and the air damp.

There are no special means of ventilating the rooms.

Two louvres on Muir's principle are required for each of the upper floor rooms. They should be placed in the ridge. Two shafts are required for each of the lower floor rooms. Each room above and below should also have four louvred ventilators for inlets, two on either side close to the ceilings.

Each room should have one large-sized ventilating grate for warming the air in cold and damp weather.

*Drainage.*—As the surface of the ground within the fort is very slightly raised above the water, the levels are unfavourable for drainage. But unfavourable as they are, the levels are rendered more so by the method of drainage adopted. There is one large drain 18 inches square, commencing at the canteen, which, after traversing the works, has its outlet into the sea. Another closed drain proceeds from the officers' mess along the front of the hospital, and joins the main drain at right angles. As there is no flow of water through the drains they are simply nuisances on account of their size and form, and when the wind blows from the northern points foul air is driven into the barrack yard.

The other drainage is all on the suface.

The drainage requires to be examined and relaid. A few lines of 6-inch drain pipe should be laid with sufficient slope to the present outlet. The ground along the sides and ends of the barracks should be flagged and channelled; carefully laid flagged channels

should convey the surface water to trapped gulleys in the branch drains, and the outlet should terminate by a drop under the surface of the water to prevent the wind blowing up the drain as at present.

The branch drains should receive the waste water of cook-houses, ablution rooms, urinals, &c.

Provision should be made for flushing out the drains occasionally.

*Privies.*—These are in a temporary wooden structure projecting about 8 feet from the north wall of the fort over the sea, and about 25 feet above its level. The place is entered by passing out at an embrasure. This arrangement is much better for health than any that could be devised within the fort, but the details might be improved to prevent accidents. There might be proper seats and divisions, and more light and ventilation from the roof.

*Urinals.*—These are within the barrack square, and are of the usual faulty construction. They are made of large flat porous stones. Slate or earthenware urinals, with water near at hand for cleansing, would be much better.

*Water Supply.*—Water is derived from three sources, wells, rain-water tanks, and importation.

Water is found at the depth of 8 feet below the surface of the barrack yard. Any water supply obtained in this way can only proceed from two sources, namely, from rainfall pent up within the walls of the fort, and from infiltration of sea water. The extent to which one or other element prevails in the wells will depend on the amount of rainfall, and on the amount drawn from the wells. The well water is of course brackish, unpleasant, and unwholesome. It is hard, and contains a large amount of carbonate of lime and sea salt. It is unfit for drinking or culinary purposes, but it can be used for washing, ablution, and bathing at a considerable cost of soap, and also for flushing drains, and for purposes of general cleanliness.

There are six tanks for storing rain water and imported water. They are of a limited capacity, only 42,351 gallons, or about 330 gallons per head of the troops.

The sum paid by the commissariat for water brought in boats, as shown by Appendix 11., was 9*l.* 3*s.* for the year 1856, but we believe it has been greater since.

The rain-water tanks are supplied from the drainage of the bastions, works, and roofs. More water could be obtained in this way provided all the roof drainage were collected and additional tank space provided. All this water should be filtered before passing into the tanks, and as regards new tankage, it would be very advisable to construct it above the level of the ground beyond the reach of sea water or surface impurities. Great care should be taken to keep the tanks clean. Nothing is so prejudicial to health in such climates and localities as impure drinking water.

This was well understood in the time of the Turkish possession, at which period an aqueduct 1,300 yards in length and of 260 arches was built from the island to the fort across the lagoon. This work, which also served as a bridge to connect the fort with the island was partially destroyed and the water supply cut off by an earthquake in 1825, and it has never been repaired. Its place could be supplied by a small metal pipe without much difficulty, and the old water supply restored.

*Ablution and Bath Accommodation.*—The ablution room consists of a wooden shed, with a stone floor, 30 feet long and 14 feet wide, having two stone benches for holding basins. Water is not laid on, and has to be carried from a pump. There is no bath. Two would be required for purposes of cleanliness, and as the well water which would have to be used is brackish, an allowance of soap would have to be made.

*Cook-houses.*—There are two cook-houses; one a miserable hovel for the artillery; the other is built against the wall of the fort. It has no ventilation. The floor is badly paved and dirty. The boilers are of the old construction, and it has a brick oven, which requires more wood to heat it than the men have at their disposal. Water has to be carried by hand from tanks at the entrance of the fort, 100 yards off. There is a small open drain leading from the cook-house to the ditch.

The cooking arrangements require great improvement. Steel boilers and a steel oven, should be provided; the floor should be re-laid; water provided nearer at hand; and the place should be ventilated. The artillery cook-house should be abandoned, one cook-house is quite sufficient for the garrison, if properly managed.

*Women's Wash-house.*—This is a building open in front. It has seven fire-places against its back wall, a boiler, and tables along the sides. It appears to be sufficient.

*Married Quarters.*—These are on ground floor rooms with flagged floors, and objectionable for reasons already stated. Nobody should sleep on the ground floor in such a situation. Married quarters are therefore required; they should have thorough ventilation, and should be on the same plan as those erected at Corfu.

*The Officers' Quarters* are the best portions of the buildings. They are all on upper floors, entered from verandahs. The lower floors are occupied by servants. The mess room is at the opposite end of the barrack yard, in a dark, gloomy old building.

*Guard Room.*—This is a small room, and the lock-up is quite insufficient. It is entered from a door outside, and is ventilated into the guard room. These defects require remedy.

The present cells, five in number, are ventilated.

*Canteen.*—The canteen is a large, dark, damp room, with a bar and a division partitioned off for non-commissioned officers. It is the only place, however, to which the men can resort when out of barracks. There is no day room nor other place for amusement.

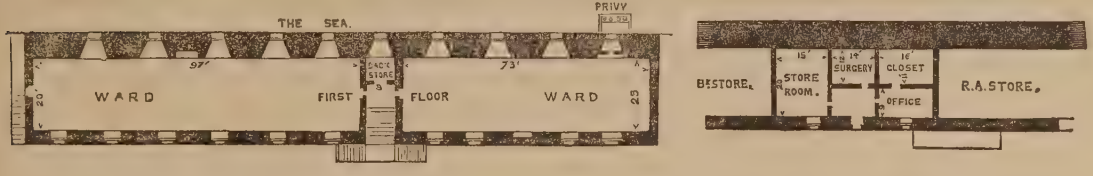
Stations such as this require reading and recreation rooms, with books, newspapers, games, &c. to give the men something to do. There is a great want of these necessaries at present.

## 6.—Hospital, Santa Maura.

This building consists of two floors, the upper one only being used for sick. It is of old construction, and the thick north wall of the fort forms its northern side. There are 10 embrasures, with glass windows in the length of the building, which, when opened, allow of free ingress for the cool northern sea breeze. There are 10 windows in the opposite wall. On the ground floor, underneath the wards, are the surgery, stores, office, and an artillery store. The pack store is up-stairs at the top of the landing, and occupies space very much required for other purposes. It is a very small room, but might be enlarged and made sufficient for an orderly's room. At present there is nobody in the building with the sick, unless in the wards, simply because there is nothing except wards.

Fig. 31 shows the arrangements of this hospital.

Figure 31.—Plan, Ground Floor and Wards of Hospital, Sta. Maura.




The following is the accommodation:—

| Wards. | Regulation Number of Beds. | Dimensions of Wards. | | | Cubic Feet per Bed. | Superficial Area per Bed. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| | | ft. | ft. | ft. | | | | ft. in. | ft. in. |
| East - | 20 | 97 | 20 | 12 | 1,164 | 97 | 3 | 5 0 | 3 1 |
| | | | | | | | 4 | 3 2 | 3 2 |
| West - | 15 | 73 | 23 | 10 | 1,119 | 112 | 6 | 3 2 | 2 11 |
| | | | | | | | 4 | 4 6 | 2 2 |

With the following exceptions, the accommodation is good of its kind; and there is not likely to be any overcrowding, on account of the improved health of the garrison. At the time we were there not a single bed was occupied. One ward was temporarily used as a reading room for want of other accommodation.

*Ventilation.*—There is none, except what depends on the casual opening of windows. Each ward requires two louvred turrets in the ridge on Muir's principle, and also inlets for fresh air along the eaves. There is a fireplace for warming the wards. It should be provided with a ventilating fire grate of the new pattern.

*Drainage.*—Similar to that already described, and requiring to be similarly improved. The roof water all sinks into the subsoil. It should be collected for use.

*The Privy* is of the same construction as the barrack privy. It is entered through a loophole at the end of the east ward, and there is a ventilated lobby between the privy and the ward. The whole projects beyond the fort wall, and is 25 feet above the water. No doubt the arrangement has certain inconveniences for sick, but it is the best under the circumstances, and quite free from nuisance.

*Water Supply.*—Water for the sick has to be carried in boats from the town. The same remarks apply to this subject as to the water supply of the barracks generally.

*Lavatory and Bath Accommodation.*—None. A shower and hip bath were standing in one of the wards.

A small space, properly lighted and ventilated, could be found at the end of the wards to hold a single bath and an ablution table, with sunk basins, and water laid on. There is plenty of room.

*Kitchen.*—This is a small building opposite the hospital, a few yards distant. Next it is the dead-house, used as a wood store and meat store. Means of cooking deficient; and the only change of diet for the sick is from boiling to frying. A small range with an oven is required.

*Attendance.*—The hospital serjeant has a room, not in the hospital, but the orderlies have no accommodation.

It would be very advisable to provide a room for the orderly on duty at the top of the stair between the wards, with a small inspection window into each ward. The bath and ablution room should also be between the wards. The pack store should be removed, and the space it occupies turned to one of these purposes.

*Convalescents.*—There is a small garden used for exercise, but it has no shade, and the cool north winds are cut off from it by lofty walls.

We may sum up the sanitary improvements required for this station as follows;—

1. Abandoning all lower floors as sleeping rooms, and devoting them for recreation rooms, stores, &c.
2. Diminution of overcrowding, by affording the men at least 600 cubic feet per man on the upper floors. And constructing additional accommodation to enable this to be done.
3. Ventilation, by ridge louvres and inlets, of all the barrack rooms and hospital wards. Ventilation of the ground-floor rooms by shafts and inlets.
4. Improved surface and deep drainage.
5. Extended water supply. Water to be laid on to ablution room, and a bath with water to be provided. Ablution room and bath required for hospital.
6. Better cooking apparatus to be provided for barracks and hospital. Cook-houses to be improved as suggested.
7. Orderlies' accommodation to be provided in the hospital.

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## IV.—ITHACA.

### 1.—Topography and Climate.

This island is situated about 12 miles from the south-east point of Santa Maura, and lies between the mainland of Greece and the island of Cephalonia, from which it is separated by a narrow channel.

Ithaca itself is about 16 miles in length; its greatest breadth is 5 miles, but its outline is so irregular that the surface only contains about 44 square miles. About midway in its length the island is almost cut across by the Gulf of Molo, the two ends of the island being united at this point by a lofty mountain ridge little more than half a mile broad. The whole island is simply a mountain mass, 1,500 or more feet in height, extending from south to north, with the two ends curved a little to the east. There are a few lateral spurs sent off by the central chain with valleys between them, but there is very little level surface anywhere. Generally, the coast dips at a high angle into the sea, or it is precipitous. The rock is principally limestone, covered on the steep slopes with thin soil and scanty herbage; but there is more fertile land and greater elements of prosperity in the island than it has received credit for.

The chief town, Vathi, where the garrison is situated, occupies a site of singular beauty, at the head of an inner bay, branching at right angles from the Gulf of Molo. Neither town nor bay are visible from the sea, and it is only after sailing half-way up the gulf that both suddenly come into view. From the land the town appears to be situated on an inland lake inclosed among mountains. A quay runs along the margin of the water, and the barracks are situated at the end of the quay nearest the sea.

There are neither lakes nor marshes in the island, and the usual sources to which malaria is attributed are hence absent; but at the foot of many mountain slopes are masses of débris, receiving the water from the higher levels, keeping the subsoil in a constantly damp state, and exposing the inhabitants of all houses built on it to malaria.

The ground about Vathi partakes of this character, but it could be improved by thorough drainage and by cutting off the water of the upper slopes by means of an intercepting drain from the ground on which the houses are built.

The lower part of the town is close on the sea level, the foundations being at or below that level; hence salt water flows into the loose subsoil under a portion of the houses. The topographical position of the town would in such a climate indicate the presence of malaria apart from marshy ground; but with proper drainage and other sanitary measures this evil could be very greatly diminished if not entirely removed.

*Climate.*—There are no instruments at the station, except a common thermometer, the mean temperatures obtained by which for two years are given in the Appendix. These show a climate remarkably temperate and equable. The lowest monthly mean in winter is 53° F.; the highest monthly mean in summer is 84°, and the greatest daily variation does not exceed a degree or two.

As regards health the climate is said to be very good; the air dry and pure; no fog or damp except during the sirocco. This is somewhat debilitating for feeble constitutions, or for persons with latent disease, but the climate is otherwise agreeable, and not detrimental to health.

### 2.—Diseases of Native Population.

We have no statistical data to show the nature of the local diseases. We have been informed that during the winter months catarrh, influenza, and intermittent fever prevail more or less among the native population; but it is stated that in many cases the fever is contracted on the Danube, where many of the male population spend nine months of every year. Other cases of fever are said to occur mostly among the people who live on ground floors, a tolerably certain indication of the sources of local malaria. Spleen and mesenteric disease are also common.

### 3.—Mortality and Diseases among the Troops.

The force in barracks at Vathi has been very small. For the 20 years preceding 1837 it averaged only 65 men; but, small as the force was during these years, it yielded a mortality of 26·1 per 1,000 per annum. Of this mortality 10·7 per 1,000 was due to fevers.

Out of 14 fever deaths, 11 were caused by remittent, two by intermittent, and one by common continued fever. This fact is sufficient to show the important influence which local malaria then exercised on the health of the troops. In some years more than half the garrison was attacked by malarial diseases. Diseases of the lungs, consumption, hæmoptysis, pneumonia, and catarrh occasioned a mortality of 9 per 1,000 strength, nearly half of which was due to consumption.

The returns for the next 10 years, given in the statistical reports (1837-46), show an improved state of health. The average strength during the period was 57, and the annual ratio of mortality was 21 per 1,000. Fevers and diseases of the chest were still the chief causes of death. The former class occasioned a loss of 11·8 per 1,000, more than half of which was due to remittent, and the rest to continued fever. The mortality from chest diseases was due to consumption and pneumonia.

A return made for us by the medical officer in charge, Appendix 15, including a period of seven years ending December 1859, gives the average strength at 54 men, and the average admissions to hospital at 760 per 1,000 per annum. Of this ratio of admissions 147 per 1,000 was due to fevers, less than one-half being due to intermittent, and the remainder to continued and remittent fevers, chiefly the former. There was only one death during the seven years, and that from neither fever nor pulmonary disease.

The year 1860 was a healthy year. The strength was 49 men, of whom there were 28 admissions to hospital, three only being from fever of the continued type. There were no deaths.

During the first three quarters of 1861 the average strength was 60, and there were 43 admissions to hospital, only three of which were from continued fever. There was one death from chronic bronchitis.

The continuous improvement in the health of the troops at this station indicates improved sanitary conditions in the locality and in the general management of the troops. Local malaria, nevertheless, has to be guarded against in Ithaca, as elsewhere in these islands; and there is quite enough about the barracks and hospital to call it into activity whenever unusual moisture with heat occurs.

This liability to malaria is partly due to lowness of position, partly to the water from the hills gravitating towards the site of the town and barrack, and partly to the bad sanitary state of the town itself.

## 4.—Sanitary Condition of the Barracks.

The barracks are situated close on the edge of the bay, at the foot of a slope descending from a mountain which rises at a short distance behind them to a height of about 1,500 feet. They are away from the mass of the civil population, at the end of the town nearest the entrance of the bay.

A stone quay is carried along the edge of the water, in front of the barracks and houses, forming a good street, and adding materially to the healthiness of the locality, by ensuring a certain depth of water along the shore and preventing the deposit of putrescing substances close to the houses. The great depth of water in the harbour is also another element of health of no small importance, by the rapid dilution and disappearance of impurities which it ensures.

There are no sources of malaria along the foreshore near the barracks. The elements of malaria must be sought for at the base of the declivities and in the comparatively level ground on which the strip of houses is built. This ground is formed of débris resting on the limestone rock at the water level and above it. It is saturated with mixed salt and fresh water, the former from the bay, the latter from the mountains above. This is proved by the state of the wells, which yield brackish water.

The ground, moreover, appears to be charged with organic matter from bad surface cleansing and want of drainage. Notwithstanding the ready outlet to the bay, we saw foul stagnant water and filth resting in badly-constructed gutters among the houses, and the soil looked black and saturated with foul matter.

The ground within the hospital enclosure is in this state. It has no drainage except by a foul surface drain close under the ward windows. The privy is over a cesspit not 20 feet from the well, and the contents of the cesspit are buried from time to time in the soil of the small garden in which it is situated.

With such a condition of the subsoil, the production of malaria of a very intense character is inevitable, whenever the conditions favouring its production come round.

This beautiful and interesting island ought to be healthy. It is popularly considered as inevitably the seat of malaria; but it requires a very slight examination to show that malaria in this as in many similar cases is simply a home manufacture.

This observation, although specially referring to the district where the barracks are situated, is more applicable to the town itself. Vathi, like all the Ionian towns, requires good drainage combined with water supply, good paving, and a proper system of cleansing and general sanitary police, to give it the full benefit of its beautiful natural position.

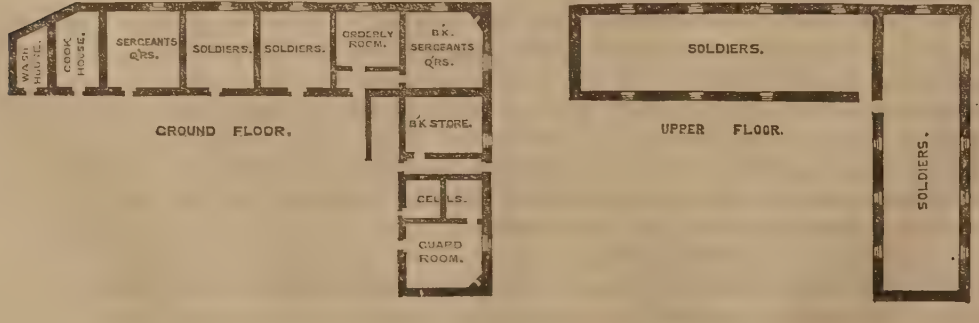
The barracks are situated within an oblong area of ground of 780 square yards, on a subsoil consisting of gravel and débris resting at a certain depth on rock. The foundations are at the water level, and the means of drainage not very good. The buildings are in two floors, and they are bent at right angles to form two sides of a small square, the remaining sides being formed by the boundary wall.

The ground floor is divided into a number of small apartments containing serjeants' quarters, kitchen, store, guard room, cells, and we are sorry to say two of these ground floor rooms are allotted as barrack rooms for 12 men. The apartments are boarded, and have openings for ventilation under the floors on one side. Opposite openings to allow of a thorough draft under the floors are required.

The whole of the upper floor is divided into two rooms, one on each side of the angle. They are reached by an outside stair in the corner.

A plan of the two floors of this barrack is given in Fig. 32.

Figure 32.—Plan of Barracks, Ithaca.



There is regulation space in the barrack for 92 non-commissioned officers and men, as follows:—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Accommodation at 600 Cubic Feet per Man. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | ft. | ft. | ft. in. | | | | | ft. in. | ft. in. |
| 1 | 40 | 70 | 18 | 10 6 | 330 | 31 | 22 | 7 | 4 6 | 2 9 |
| 2 | 40 | 70 | 18 | 10 6 | 330 | 31 | 22 | 7 | 4 6 | 2 9 |
| 3 | 6 | 16 | 18 | 11 0 | 528 | 48 | 5 | 1 | 4 6 | 2 9 |
| 4 | 6 | 16 | 18 | 11 0 | 528 | 48 | 5 | 1 | 4 6 | 2 9 |
| Total - - | 92 | — | — | — | — | — | 54 | — | — | — |
| Guard Room - | — | 15 | 18 | 11 0 | — | — | — | 1 | 4 6 | 2 9 |
| Cells, 2 - - | — | 9 | 8½ | 11 0 | — | — | — | — | — | — |

*Overcrowding.*—These rooms can only accommodate 54 men at 600 cubic feet, but the two lower rooms are quite unsuited for barrack rooms. One of them has been turned from its purpose as a serjeant's quarter for one man, into a barrack room for six men. Both should be struck off the construction, and the occupation of the barrack reduced to 44 men at the outside, in the first-floor rooms.

*Ventilation.*—Insufficient. Each of the upper rooms has ventilating shafts in the ridge, but each requires four inlets for air, two on each of the opposite sides of the rooms close to the eaves. The lower rooms all require inlets of the same kind close to the ceiling, one on each of the opposite sides.

*Drainage.*—As the barrack yard lies close to the level of the sea, and at the foot of the watershed, it is imperfectly drained, and the surface was in parts wet when we were there. There is a drain running the whole length of the ground, which enters the sea after passing under both the prison cells. A branch drain from a gully runs across the upper end of the ground to this longitudinal drain. The lower end of the ground, between the barracks and the boundary wall, is not drained, and indeed the arrangement of the walls and buildings is unfavourable to good natural drainage. Within this area a shallow well has been dug, the use of which, so far as we could learn, was to supply water for flushing the privies. It is situated at the lowest point of the enclosure, and within a few yards of the sea.

There were at the time three feet in depth of water in this well, salt and fresh water mixed, which together with the organic matter finding access to the well, enters into decomposition, and produces great nuisance in warm weather. This contrivance should of course be filled up and abolished; the result of its formation has, however, afforded an interesting practical illustration of the manner in which foul air is generated in the subsoil of such localities.

*Latrines.*—These have recently been removed from the higher end of the ground to the lowest point, against the boundary wall, and they are drained by a barrel drain 25 feet long into the bay. The latrines are merely an open trough, into which water for cleansing is thrown by hand. They are most offensive, and their construction is very defective.

They require to be replaced by Macfarlane's or Jennings' latrines, and to be properly supplied with water. There would be no difficulty in doing this by means of a pump for throwing water into a raised cistern from which the water could be drawn for supplying the latrines.

There is a urinal at the upper end of the ground, of bad construction and offensive. It should be replaced by a better form, of iron or slate urinal, and provided with water for cleansing.

As regards the general drainage of the barrack. The present large old drain should be abolished, and the whole of the ground should be tile-drained as deep below the surface as the levels will admit. A small pipe drain should be laid to convey away all waste water from kitchens, lavatory, urinal, &c. The drainage should be carried free of every building in its way to the sea.

*Water Supply.*—There is a well of brackish water within the barrack enclosure, unfit for drinking or for culinary purposes. It could be used for the latrines and similar purposes if a tank to be filled by a pump were placed at a sufficient elevation, and the water conveyed by pipes at pressure.

All other water has to be carried from a public well at a short distance above and behind the barracks, supplied by a spring in the débris at the lower end of one of the ravines.

The total quantity of water carried for the use of the troops in 1856 (the year for which we have received the return, Appendix 11,) was 46,746 gallons, at a cost of 13*l.* 10*s.* 4*d.* This would give less than $2\frac{1}{3}$ gallons per man per day for a strength of 54 men, at a cost of 5*s.* per man per annum. That is, there was paid for this very stinted supply, as high a water rate for each man as a working man in England pays under the Public Health Act for an unlimited supply for his family.

It has been proposed to lay on water from the public well to the barrack, but we believe the local authorities have objected to it. The only reasonable ground for the objection must be the fear of diverting the water from public use; but this could easily be overcome. The spring is constantly flowing, but is only wanted for public use during the day. If a tank capable of holding 2,000 gallons were erected at the higher part of the barrack boundary, a small part of the night supply would keep it full, and an arrangement might possibly be made to this effect with the municipal authorities. The water should be laid on for all purposes; and were this done it would not be necessary to use the brackish well water for any purpose.

*Ablution and Bath Accommodation.*—This is a mere lean-to shed, supported on pillars, having a stone bench and the usual moveable basins. There is a small tank beside it, from which water is obtained. There are no baths. One should be provided, and the ablution accommodation should be improved and drained. If the water supply were increased water should be laid on to the bath and to the ablution table. Otherwise the brackish well water could be used for the bath if marine soap were issued.

*Cook-house.*—The cook-house and women's wash-house occupy a small one-storey building at one end of the barracks. The cook-house has square boilers and a brick oven. It requires roof ventilation. Water is not laid on, but has to be carried from the tank. Refuse water runs away in an open surface drain into the main drain, and so to the sea. The new steel boilers should be substituted for the present boilers, and water for cooking should be laid on to a proper sink.

*Women's Wash-house.*—This is a small shed building, with two fireplaces, but without any other conveniences. It requires fittings and roof ventilation.

*Guard Room and Cells.*—The guard room has a stone floor, and has no ventilation. It should have inlets for fresh air on the two opposite sides close to the ceiling. The cells are bad, and have a drain passing under both of them. One of them is entered from the guard room, and the other from the outside. One is used as a meat store. Either of the cells is a very likely place for a tipsy man to get fever in, and therefore one or two new cells should be constructed.

There are no means of recreation except a skittle shed. There is no reading or day room, no serjeants' mess, and not even a canteen.

The strength at this station should either be reduced to give sufficient space for the men or the barrack accommodation should be extended to provide space, means of recreation, and conveniences required by the garrison.

### 5.—Hospital, Vathi.

This is a mere apology for a hospital. It consists of the upper floor of a private house, situated in a narrow filthy lane, about 200 yards from the barracks, and by no means in so good a situation as the barracks occupy.

The ground floor of the house is occupied by a Greek, who lets the upper part; and there is only a thin wooden floor between the family living room and the sick ward above.

The room used for patients is 27 feet 9 inches long, 23 feet 8 inches wide, and 9 feet 5 inches high, and is supposed to have space for six beds at 1,030 cubic feet per bed. There are three small low windows along one side, and one similar window opposite. The hospital serjeant's quarter and surgery are on the same floor; also a small apartment used as a kitchen. There is a damp store room below. There are no conveniences of any kind. The privy is in the back yard or garden, and is connected with a cesspit. Water is thrown down the privy into the cesspit, and the porous soil takes up as much of it as it can. Any solid matter is taken out four times a year and buried in the garden. There is a well in the garden about 20 feet from the cesspit. A very foul surface drain runs down the garden and under the doorway into the street, and the whole surface of the ground when we saw it was filthy.

A small hospital for half a dozen beds, with the most needful conveniences, is absolutely necessary; it would be a mere waste of money to endeavour to make the present room suitable for sick.

## V.—CEPHALONIA.

### 1.—Topography and Climate.

Cephalonia, the largest of the Ionian Islands, lies across the entrance to the gulf of Corinth, at a distance of about 21 miles from the nearest point of the Greek coast. The island is about 31 miles long by 25 miles broad at its widest part. It is very irregular in form, and is deeply indented by an arm of the sea on its southern side. It consists of lofty mountains rising to the height of from 3,000 to 4,500 feet above the sea, the highest of which, called the Black Mountain, a few miles to the east of the military station, is covered with snow in winter. The southern end of the island is considerably raised above the level of the sea, and the ground slopes from the highest point towards the gulf of Argostoli, on the shores of which the barracks are situated. The base of the island is limestone, with which are associated several other formations, and there are abundant evidences of the action of subterranean forces. One of the anomalous appearances presented by the shore at a short distance from the barracks, is the sea running into the land by channels cut for the purpose and driving mills in its course.

The part of the island with which we are more immediately concerned is the district around Argostoli, the capital, and also that in the vicinity of Luxuri, on the opposite side of the gulf. Commercial purposes, in this as in other districts of these islands, have led to the towns being placed in the lowest and most unhealthy spots to be found, thereby reversing the principles on which sites for ancient cities were chosen. In all directions round Argostoli there are plenty of sites for towns, and within view are the ruins of one of the ancient cities, on a hill, several hundreds of feet above the sea; while the ground on which the present capital is built is the lowest obtainable. It receives the drainage from a large tract of higher country to the south and east, and close to the eastern end of the town is a salt marsh, half a square mile in area. This marsh has long been a cause of serious periodic fevers, affecting the inhabitants of the eastern extremity of the town, but, thanks to more enlightened views on the subject, it is now being filled up; a measure which will improve materially the health of the community, and at the same time reclaim much valuable land.

Argostoli contains about 10,000 inhabitants, and is by far the best laid-out town in the Ionian Islands. The western end of it consists of spacious open streets, formed of a class of houses much superior to those in other Ionian towns; and there is a more general appearance of industry, cleanliness, and comfort among the people.

But under the surface there is the same want of sanitary works as exists elsewhere. Much of the area covered by the town is little, if at all, raised above the level of the water; and there are abundant evidences of absence of proper drainage and strict sanitary supervision.

Here, as elsewhere, the aid of the sanitary engineer is required to introduce combined works of drainage and water supply, and to improve the paving and surface drainage.

Luxuri is in a much worse condition than Argostoli. It has no drainage except by foul open gutters, the paving is bad, and the whole town is in a very filthy state. It requires great improvement to make it healthy.

*Climate.*—We have received no account of the climate, except the general statement that it resembles the other climates in these islands, with greater variability on account of its lofty mountains. The air is said to be pure, except during the sirocco, when the climate is stated to be most oppressive and debilitating.

The winter months are considered the most healthy, the autumn months are the most unhealthy. Severe fevers and bowel complaints then prevail.

### 2.—Mortality and Diseases among the Troops.

The report on sickness and mortality in the army (1839) gives the following information on this subject, for 20 years preceding 1837. During this period the average strength in garrison was 374, and the average annual mortality was 30·5 per 1,000. Of this death-rate 15·6 per 1,000 was due to fevers, and 6 per 1,000 to chest diseases. Nearly three-fourths of the fever mortality were due to remittent, and about one-fourth to continued fever. About two-thirds of the deaths from chest complaints were attributable to consumptive diseases.

During the succeeding 10 years, 1837–1846, the average strength was 360, and the mortality was only 15 per 1,000 per annum. In one year only of this period did the death-rate reach the same standard at which it had been for the entire 20 years preceding 1837. Chest diseases, mostly consumption, occasioned a mortality of 5·3 per 1,000, but the fever mortality had fallen to 3·6 per 1,000. Remittent and intermittent occasioned seven-twelfths of the fever deaths; the remainder were due to continued fever.

During the 10 years 1850 to 1860 (Appendix 16) the average strength at the station was 603 men, among whom the admissions to hospital averaged 882 per annum, or at the rate of 1,462 admissions per 1,000. Of these annual admissions 61 were from intermittent, 45 from remittent, and no less than 220 from continued fever, showing that out of every eight cases received into hospital three were fever cases. The mortality during the same period, including 27 deaths from cholera, was in the ratio of 21·9 per 1,000 per annum. Nearly 42 per cent of the mortalitywas due to fever, half of it from the remittent and half of it from the continued type.

In 1860 there were 93 cases of remittent fever at Cephalonia during the first nine months of the year, out of a strength of about 520; and in 1861, during the same nine months, out of a strength of 542, there were no fewer than 257 cases of continued, and eight of remittent fever, received into hospital. There were two deaths during the two periods, but not from fever. The outbreak of continued fever at Cephalonia was simultaneous with a similar outbreak, but a fatal one, at Corfu.

The most important diseases at Cephalonia do not differ from those at the other islands, and their local causes are the same.

### 3.—Sanitary condition of Argostoli Barracks.

There are four principal barracks in the islands: three of them, known as the Lazaretto, Mescopulo, and New barracks, are at the west end of the town of Argostoli; and the other is at Fort St. George, on the summit of a lofty hill seven miles to the east.

The town barracks are all close together, and are built on the slope of a hill falling rapidly to the level of the bay. Their position is shown in the Plan No. XXXV.

Mescopulo barrack is the highest up, and is between 140 and 150 yards from the water. Immediately below, and enclosed within high walls, are the Lazaretto buildings, used as a barrack. The New barrack is a little lower down than the Mescopulo barrack, and about 150 yards to the east of it. All the buildings are either on steep sloping ground or immediately at the foot of the slope.

There is a large water shed above and behind them, and they are all built right across the downfall of the natural drainage. Towards the bay there is little to complain of, except that the site of the Lazaretto barrack is too near its level; but towards the land the position is a very bad one. The lofty hills behind consist of fissured limestone, with red earth and débris. The slopes are occupied by numerous olive trees and by other vegetation. Much reflected heat is thrown from the bare rock wherever it is exposed to the sun; and as no means have been adopted for cutting off the drainage of the hills from the ground occupied by barracks, the position occasions damp in the lower floors of the barracks, and is in all respects a very likely one to subject its occupants to malaria; but the new north barrack is not so exposed to this disadvantage as the other two.

Besides these defects in position, none of the buildings are of such a nature as to render their use desirable for barrack accommodation. Two of them are hired houses, and the other is a lazaretto, belonging to the Government, repaired and partially rebuilt in 1834. None of them when constructed were intended for occupation by a number of men, and they are not suitable for it in such a climate.

The hired houses are kept in repair by their proprietors, and Government rents them. The result of so very objectionable an arrangement is, that repairs are not executed without much difficulty, and that the alterations and additions required to turn the buildings into healthy barracks unless executed at Government expense would, in all probability, never be undertaken; and after all was done the sites would be as bad as ever.

There is no question that the best thing to do, and the cheapest in the end, would be to build a healthy barrack on a well-selected and healthy site, and to give up the present premises altogether.

Although all the buildings constitute one occupation, and have certain things in common, we shall describe each of them briefly, and point out the sanitary defects in each.

#### 1.—*Lazaretto Barrack.*

This barrack is placed close on the edge of the bay, and at the foot of the slope. It is separated from Mescopulo barrack by a public road which skirts its south-west wall. The ground along the road is above the level of the barrack yard, and there are two ranges of soldiers' quarters, one with its side the other with its end to the road, and separated from the road only by the wall. These rooms have their floors below the level of the road. In one of the rooms referred to, all the beds along one side are below the level of the ground outside, and the men sleep with their heads to the section of the ground, having only the wall intervening. No attempt has been made to cut off the hill

drainage; on the contrary, the wall alluded to is built right across the natural outfall of the drainage. The locality is about the last that ought to be chosen for barrack accommodation; otherwise, the room is one of the best at the station.

The buildings generally are arranged in the form of a square, having soldiers' quarters on three sides, and the quartermaster's store, &c. on the other side. On one of the sides there are two blocks containing quarters, with a passage between them. Three of the blocks are two floors in height, and have the men's rooms on the upper floors. The other block is the one already alluded to as lying below the level of the road. It contains only a ground-floor room, which for the reason assigned above used to be very unhealthy, although it has been recently much improved in this respect by having roof ventilation provided. But the room will never be fit for permanent occupation unless the earth be cut away from its back wall, and an area be left between the wall and the earth to prevent damp.

The lower floors of the other blocks are divided into compartments for married quarters by partitions about 8 feet high, so arranged as to give each division the whole or part of a window.

The lower-floor rooms stand on the construction as men's barrack rooms, a purpose for which they are utterly unfit, although at the time of our inspection they were not so occupied.

The upper-floor barrack rooms have windows on opposite sides; but they are casements with shutters, having only a small pane of glass in the upper part of the shutter. The windows are small and low for the size of the rooms. None of the rooms have proper iron fittings, only hanging wooden shelves in the middle of the rooms, obstructing the ventilation.

There are no ceilings, only open roofs, through which the sun heat radiates strongly in summer. There are no fireplaces. A room occupied by artillery is small and dark.

The occupation of this barrack varies considerably.

In the following table we have given the number per room, obtained from two separate sources, as it existed in 1859, and in April 1860:—

| Rooms. | Number of Men per Room. | | Dimensions of Rooms. | | | Cubic Feet per Man, 1860. | Superficial Feet per Man, 1860. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1859. | 1860. | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| *Upper Floor.* | | | ft. in. | ft. in. | ft. in. | | | | ft. in. | ft. in. |
| No. 1 - - | 38 | 31 | 66 0 | 23 0 | 13 11 | 681 | 49 | 7 each room | 5 8 | 4 |
| 6 - - | 38 | 31 | 66 0 | 23 0 | 13 11 | 681 | 49 | | | |
| 11 - - | 38 | 31 | 66 0 | 23 0 | 13 8 | 669 | 49 | | | |
| 15 - - | 38 | 31 | 66 0 | 23 0 | 13 8 | 669 | 49 | | | |
| *Lower Floor.* | | | | | | | | | | |
| No. 2 - - | 16 | 10 | 32 0 | 23 0 | 11 2 | 821 | 73 | 3 each room | 5 0 | 4 |
| 3 - - | 16 | 10 | 32 0 | 23 0 | 10 8 | 800 | 73 | | | |
| 4 - - | 16 | 10 | 32 0 | 23 0 | 10 8 | 800 | 73 | | | |
| 5 - - | 16 | 10 | 32 0 | 23 0 | 9 5 | 693 | 73 | | | |
| 7 - - | 25 | 18 | 40 0 | 21 0 | 14 10 | 690 | 46 | each room 4 | 5 0 | 4 |
| 8 - - | 25 | 18 | 40 0 | 21 0 | 14 10 | 690 | 46 | | | |
| 9 - - | 25 | 18 | 40 0 | 21 0 | 14 10 | 690 | 46 | 4 | 2 6 | 2 |
| 10 - - | 15 | 10 | 32 0 | 23 0 | 10 6 | 772 | 73 | 3 each room | 5 0 | 4 |
| 12 - - | 16 | 10 | 32 0 | 23 0 | 10 6 | 772 | 73 | | | |
| 13 - - | 16 | 10 | 32 0 | 23 0 | 10 6 | 772 | 73 | | | |
| 14 - - | 16 | 10 | 32 0 | 23 0 | 10 6 | 772 | 73 | | | |
| *Royal Artillery.* | | | | | | | | | | |
| No. 16 - - | 9 | 9 | 24 0 | 15 0 | 12 0 | 800 | 40 | — | — | — |
| 17 - - | 1 | 4 | 15 0 | 12 0 | 11 4 | 510 | 45 | 1 | 4 | 3 |
| 18 - - | — | 18 | 25 0 | 22 0 | 12 0 | 355 | 30 | 3 | 4 | 3 |
| Total - - | 364 | 289 | — | — | — | — | — | — | — | — |
| Guard Room - | — | 9 | 16 4 | 13 4 | 13 6 | 325 | 24 | — | — | — |
| Cells - - | — | 1 | 13 0 | 7 0 | 9 0 | 819 | 91 | — | — | — |

*Overcrowding.*—The number of men a barrack ought to contain, with due regard to health, depends on its local position, construction, &c. The question as to the present barrack is not whether the amount of space per man is sufficient for health, but whether there should be any men in it at all. If ever there were 364 men in the Lazaretto barrack there need be no wonder at the occurrence of fever. It is only what should have happened. To judge of the state of the barrack only from the space per man shown

in the table would be fallacious, for there are rooms unfit for occupation, and which cannot be rendered fit.

The ground-floor rooms 2, 3, 4, 5, 10, 12, 13, 14, should be struck off the construction altogether. No. 18 has twice the number of men it ought to hold. Nos. 7, 8, and 9, as occupied in 1860, gave only 46 square feet per man, and were much overcrowded, notwithstanding their large cubic space, in which is included the open roof. There is considerable surface overcrowding in the upper-floor rooms; and if a third of the men were removed out of them and out of Nos. 7, 8, 9, the superficial area for the remainder would not by any means be excessive. These upper rooms, Nos. 1, 6, 11, and 15, are, however, the least exposed to malaria, and with plenty of ventilation would be the healthiest in the place for their cubic contents. It would make them cooler and more comfortable to line and plaster the roofs.

These reductions would have the following effect on the barrack accommodation :—

The eight ground-floor rooms 2 to 14, which have hitherto held from 80 to 127 men would cease to be occupied; No. 18 would hold 9 men; Nos. 7, 8, 9, which have been hitherto occupied by from 54 to 75 men would hold 12 men each, 36 in all; Nos. 1, 6, 11, 15, hitherto occupied by from 124 to 152 men would hold 21 men each, or 84 in all; No. 16 would hold 6 men instead of 9; and No. 17, 3 men instead of 4.

The Lazaretto barrack would thus accommodate 165 men and no more.

If this barrack must be occupied we would propose to fix this number as the limit of the accommodation.

*Ventilation.*—The rooms immediately under the roofs have ridge ventilation, but they have no inlets for fresh air along the sides. Four inlets are required along each side of each room under the eaves.

All the ground-floor rooms require ventilation by shafts carried above the roof and by inlets along the sides.

*Drainage.*—The drainage of the barrack square is all on the surface, and is in a bad condition, from want of proper guttering. Boulders are used for this purpose, and they are always unsuitable. Guttering cut out of flagstone, properly laid, is the best kind of surface drain for the situation. All refuse water is conveyed, partly by surface, partly by underground drains, to the sea in front.

*Latrines.*—There are two of these, one at each end of the barrack enclosure, and close to the sea. One appears to be connected with a cesspit; at all events, there is a cesspit beside it; and the other is over a small drain, into which the sea washes. This latter is accessible to all the troops in the three barracks. There is no current to carry off the soil, which creates great nuisance in consequence. The construction is otherwise bad. Macfarlane's or Jennings' latrines, properly supplied with water pumped up from the sea, should be introduced, instead of the present arrangement; and the iron pipe of the latrine should be carried into deep water at a sufficient distance to insure the soil being diluted in deep water and removed.

The urinal beside this latrine should be reconstructed of non-porous material and kept clean.

The cesspit beside the other latrine should be abolished.

*Water Supply.*—The only source of water for these barracks is rainfall collected from the roofs of three of the ranges of building, and stored in a tank capable of containing 62,855 gallons, constructed under the middle of the barrack square, and from which the water is raised for use by a pump. The quality is described as generally good, but the amount of tankage is stated to be only sufficient for eight months of the year. This must mean that it is sufficient for eight months of the year only because of the large amount which has to be carried every month in the year for the use of the troops. In 1856 there were brought into the three barracks 752,966 gallons, or 12 times the amount of the tank capacity in the Lazaretto, at a cost of 80*l.* 11*s.* 8*d.* to the commissariat. It would be worth while to inquire whether an unlimited supply might not be procurable on the hills above, and laid over the whole barracks, at an outlay of capital not more than is represented by the charge for importing this prime necessary of health and cleanliness, in the limited quantity at present available. At any rate the tank space should be increased, and this might be done with advantage on the higher ground behind the barracks. The surface water of the slope above, and the roof water also of Mescopulo barrack, might be stored at an elevation sufficient to enable a constant water supply to be laid on to all the barracks. Filtration would be necessary before the water was permitted to enter the tank.

*Ablution and Bath Accommodation.*—The means of personal cleanliness are insufficient. The ablution room is a small dark outbuilding without ventilation. It has low small windows. There are benches along three sides for holding the usual basins. The refuse water runs away by a surface drain, there are no gratings for men to stand on, and there is no water laid on. The men have to carry all the water they require for washing from the pump.

A larger ablution room, sufficient to accommodate a tenth part of the force at the same time, is required; it should be very light, well ventilated, drained, and supplied with water. There are no baths in any of the barracks. A proper bath-house with five baths and water laid on, and drained to the sea, should be constructed in a locality convenient for all the troops.

*Cook-house*—This is a small dark building containing boilers and a brick oven. There is roof ventilation, but not sufficient for coolness, and the oven requires so much fuel that the men prefer sending their dinners to be baked outside because it is cheaper. The cook-house requires improved steel boilers and a steel roasting oven. More roof ventilation should likewise be provided.

There is another small dark cook-house used by the royal artillery. It has an oven and open fireplace, but no boilers. Only few men use it, and with good management one cook-house should suffice.

*Women's Wash-house.*—The wash-house is a small lean-to shed, with a boiler in one corner, and a bench in the middle of the floor to hold tubs. The place is quite insufficient for washing the men's linen. A proper wash-house suitable to the size of the barrack with fixed tubs, and other conveniences, is much required.

*Married Quarters.*—These are at present partly in the ground-floor rooms of the side barrack ranges, partly in small dark lean-to buildings among the out-houses. The best that can be said of the accommodation is that it is better than none. But no better is available, and better quarters could only be obtained along with better barracks. All the existing married rooms require ventilation.

There is a very small serjeants' mess, entered by passing through the kitchen. There is no pantry nor place for beer. A separate entrance should be provided, and the pantry, &c. provided at the same time.

*Library and Reading Room, &c.*—This accommodation consists of two small dark rooms, very uncomfortable in appearance, and not properly fitted up. The allowance of oil for light is insufficient, and the lamps are of bad construction.

A good fives' court was built by the officers of the rifle brigade, but it is not kept in proper repair. There is a covered skittle alley made out of an old Crimean hut. The means of recreation are deficient, and far better library, reading, and day room accommodation is indispensable.

*Canteen.*—Dark, dirty, and unattractive. A new and good canteen is required.

*Workshops.*—There is an armourer's shop, which is too dark. The tailors' and shoemakers' shops are together in the same room a very objectionable arrangement. The room is reached by a dark passage; it has no ventilation, and the tailors' fire is outside.

*Guard Room and Cells.*—The guard room is at the entrance of the barrack square, and has the lock-up room opposite to it. The guard room has a shaft and inlet, but is too dark; and the lock-up room is so situated with reference to the parade ground and to the officers' staircase, that every word of conversation is heard in the lock-up. A new guard room and lock-up should be constructed near the fives' court.

We have said enough to show what kind of barrack accommodation is supplied by the Lazaretto, and we have restricted our recommendations to the points of greatest necessity, in the hope that the whole question as regards this important station may be considered with reference to providing suitable barracks in a better locality.

### 2.—*Mescopulo Barrack.*

This is a large private house built against the hill slope on the opposite side of the road, higher up than the Lazaretto barrack.

It consists of a basement story with openings only to the road, and having its back against the rock.

This basement is let separately from the barrack rooms and was occupied as shops.

Above it are two floors of rooms, each having eleven windows to the front, with an additional floor over the centre of the front. The buildings are carried back towards the hill, so that when looked at from that side they have a narrow centre and two large wings. These wings have windows on the four sides, and are occupied as barrack rooms, ablution room, &c., and the centre rooms are used for non-commissioned officers.

On account of the slope of the hill, the floor which appears as a first floor when seen from the front, is actually a ground floor when seen from the hill, with the higher ground sloping rapidly towards it.

We have already shown that during the first nine months of 1861, but chiefly during the third quarter of the year, nearly half the troops at the station were admitted to hospital on account of fever. A large proportion of the cases came from this very floor of Mescopulo barrack, and the rooms had to be evacuated in consequence. Removal to the floor above was found to arrest the disease. The disease was mainly due to the position of the building; for it has long been known that tenements built across the slopes of

hills without attention to turning off the drainage from the higher levels, are particularly liable to have zymotic diseases among their inmates.

Besides this, the drainage of the court behind the barracks was in a very bad state, and the whole interior of the building had been rendered more damp than it otherwise would have been, by the ablution room, having been placed among the barrack rooms and under one of them. Damp from such a cause, in such a house and climate is only another name for malaria.

A nuisance is complained of which proceeds from rotting sea-weed thrown up along the shore. The only way to prevent the deposit of such matters would be to quay the margin into deep water. But regular removal of the deposit to deep water would diminish the nuisance.

There are nine rooms in the house, six of which are used for soldiers' quarters. The remainder are occupied by serjeants. The following table gives the accommodation :—

| Rooms. | Regulation Number of Men. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. |
|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | |
| *Lower Story.* | | ft. in. | ft. in. | ft. in. | | |
| No. 1 | 8 | 23 0 | 12 10 | 14 5 | 530 | 36 |
| 2 | 13 | 23 0 | 22 8 | 14 5 | 594 | 40 |
| 3 | 9 | 24 6 | 14 9 | 14 5 | 580 | 40 |
| 4 | 23 | 37 3 | 23 0 | 14 5 | 547 | 37 |
| 5 | 20 | 30 0 | 24 6 | 14 5 | 515 | 32 |
| *Upper Rooms.* | | | | | | |
| No. 6 | 40 | 50 3 | 30 6 | 13 9 | 527 | 38 |
| 7 | 40 | 50 3 | 30 6 | 13 9 | 527 | 38 |
| 8 | 8 | 18 9 | 16 10 | 13 9 | 550 | 40 |
| 9 | 13 | 24 2 | 24 2 | 10 2 | 458 | 45 |
| Total | 174 | — | — | — | — | — |

*Overcrowding.*—The degree of overcrowding allowed by regulation in this barrack is to be judged of by the superficial area per man, which is about one-half what it ought to be. The actual number of men in barracks has been considerably less at times than the regulation number. At the time of our visit there were 124 men in the rooms. For the reasons stated in regard to position and drainage, the upper-floor rooms are by much the best in every way, and are the only rooms which ought to be occupied.

The occupants of the lower floor will always be the most liable to fever. We would propose to reduce the numbers of men in the lower rooms by about a half, or from 73 to 40, and as the upper rooms are the highest above the ground and the least unhealthy we consider that if the number of men in them were reduced from 101 to 70 the reduction would be sufficient. The house would thus hold 110 instead of 174 the present occupation.

*Ventilation.*—The rooms have abundance of windows, but they are too low to ventilate sufficiently the upper part of the rooms. The rooms all require ventilation in the usual way by shafts carried up through the roof and by inlets for fresh air on opposite sides.

*Drainage.*—None except into a cesspit to the east of the barrack, which receives the drainage from the kitchen &c. There is a large foul open drain in the back yard.

There is an open or partially open drain also running to the public road. Both are objectionable and ought to be done away with. There is every facility for proper drainage to the sea.

To cut off the hill drainage, and to flag, channel, and drain the small square and ground behind this building, are improvements which ought to be carried out if the barrack is to be occupied.

*Water Supply.*—Same as for Lazaretto; and water is carried by contract.

*Ablution and Bath Accommodation.*—The ablution room is within the building, in one of the wings, and under a barrack room with only the floor boards between. The rooms near the ablution room have been unhealthy, simply because the air in them has been rendered damp and unwholesome by having a large wet surface constantly moistening the air. An essential improvement would be to remove the ablution accommodation altogether into a properly constructed ablution room outside, provided with water and drainage. The same bath-house proposed for the Lazaretto barrack would suit these barracks.

*Cook-house.*—The cook-house is in a small shed building above and behind the barrack. It has three rectangular boilers, but no oven. Improved steel boilers and oven are required.

### 3.—*New North Barrack.*

This is another hired building situated to the eastward of Mescopulo barrack, in a more open situation and not so much exposed to the drainage from the higher ground

behind. It consists of a single building about 100 feet long, and two floors in height, with a passage and staircase in the middle of its length, dividing it into four barrack rooms, each having regulation space for 24 men at about 500 cubic and 37 square feet per man. The rooms are the best at the station, so far as their appearance goes. They have windows on opposite sides, but on the other hand the floors of the lower rooms are not raised above the surface, and their occupants are exposed to malaria from the ground.

The rooms have no ceilings, and no proper iron fittings. They have only hanging shelves.

There is a filthy damp space under the stair, which ought to be filled up.

The non-commissioned officers' quarters have fireplaces, and windows on each side. The floors are of wood resting on the ground.

*Overcrowding.*—This barrack has too many men in it. The lower floor should either not be occupied or the number of men should be reduced considerably. The upper-floor rooms should at the very outside have no more than 20 men in each room. This would give space for 40 men above, and as few as possible should be placed on the ground floor. Were there better accommodation available, the ground floor should be abandoned.

*Ventilation.*— None, except door and windows. Each upper room requires two louvres in the roof, and four inlets along each side close to the ceiling. The lower rooms require two ventilating shafts each, and four inlets along each side. The rooms have common fireplaces, which are never used.

*Drainage.*—Very bad. The surface paving is defective, and the surface drainage creates nuisance. There is no drain to the sea, although it is only 70 yards distant. All foul water, except such as evaporates or sinks into the subsoil, is conveyed to a cesspit close to the buildings, from which it percolates into the subsoil. Any matter collecting in this cesspit is removed every two years.

Although this barrack is healthier than the others, we were informed that the men occupying one of the rooms which is exposed to effluvia from the drainage, were not so healthy as the remainder.

The privies are those already described as over the sea.

*Water Supply.*—From the same source as in the other barracks.

*Ablution and Bath Accommodation.*—A shed building behind the barrack, dark, damp, and badly paved. Stone tables, all apparently ruinous. The whole requires reconstruction. There is no bath.

*Cook-house.*—A small lean-to, behind the barrack, fitted with two very thick rectangular boilers. No other means of cooking. Steel boilers and an oven should be provided. There is an open offensive drain passing in front of the cook-house, into which refuse water, &c. is thrown.

### *Provost Establishment.*

The Provost establishment is at the south side of the Lazaretto barrack, and contains 9 cells certified for 28 days. They are in two floors, they have a verandah, and are ventilated by opposite grated openings.

Behind these are several seven-days cells quite unfit for occupation, partly from position, partly from want of ventilation. They are said not to be occupied at night.

## 4.—Hospital, Argostoli.

This hospital is of recent construction and was first occupied in 1856. It is built on a terrace formed out of the hill slope, about 20 feet above the level of the sea, and at a distance of 50 to 60 yards from it. It is about 350 yards to the north-west of the barracks. A public road passes close to its front.

The site is airy enough on three sides, but on the side next the hill ventilation is completely cut off by the rock, which rises far above the buildings, while the site is otherwise open to the objection already stated against the barrack sites, namely, that the hill drainage passes into it. In this one of the latest erected buildings in the command, sanitary principles have been so little regarded that it has been placed on ground which ought either to have been avoided, or if occupied under the pressure of necessity, care should have been taken to cut off the hill drainage. There is, however, ample ventilation between the lower floors and the ground, an advantage not possessed by the barracks.

The hospital is two floors in height, and has a passage and staircase crossing the middle of it.

On one side the centre are two back-to-back wards on each floor: a form of construction inadmissible in hospitals. On the other side, on the ground floor, are the surgery, stores, hospital serjeant's quarter, and part of the medical officer's quarter. Upstairs there

are on the same side two back-to-back wards, together with the remainder of the medical officer's quarters, which are cut off from the hospital and have a separate entrance.

There are six wards, originally intended to hold 90 beds, but the hospital is by no means capable of accommodating this number. The following table gives the details:—

| Wards. | First Allotment of Beds. | Dimensions of Wards. | | | Cubic Feet per Bed. | Number of Beds per Ward at 1,200 Cubic Feet. | Windows per Man. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | Number. | Height. | Width. |
| | | ft. in. | ft. in. | ft. in. | | | | ft. | ft. |
| 4, each - | 90 | 48 8 | 19 8 | 13 6 | 714 | 10 | 10 | 7 | 4 |
| 2, each - | | 22 10 | 19 8 | 13 6 | | 5 | 2 | | |
| Total - | 90 | — | — | — | — | 50 | — | — | — |

The wards were not overcrowded at the time we were in them, and they might very well hold 50 beds. This is a larger number of beds than ought to be required at this station if the barracks were as healthy as they ought to be.

*Ventilation.*—The construction is not well adapted for ventilation, as the wards have windows only on one side. The wards all require shafts carried up along the division wall between the wards above the roof. They should also have inlets for fresh air close to the ceiling.

The smaller wards require one shaft and two inlets each, and the larger wards two shafts and four inlets each.

The larger wards have stoves, in fireplaces, for warming. Ventilating fire grates, constructed for burning wood, should be substituted in lieu of these.

The passages, staircases, and stores all require ventilation.

*Drainage.*—Very bad. There is a narrow back yard between the hospital and the rock behind, in which are situated the kitchen, privies, a prison ward, &c. This yard is paved with pebbles, it is rough, and cannot be kept clean in consequence.

There are imperfect surface drains for removing the surface water into a main drain connected with the privies. This is an underground drain 18 inches by 14 inches, which after being conducted in the longest possible course round the hospital, has its outlet into the sea 40 yards distant. This drain is in a bad state, and great nuisance arises from it at times. It appears to be partially destroyed by rats.

*Latrine.*—The latrine is beside the kitchen, and is merely an open trough flushed out with sea water into the drain already mentioned. The place was in a most abominable condition on account of defective construction. The whole drainage requires renewal. As much as possible of the rain water from the higher ground should be diverted from the hospital, by a deep catchwater drain and tanked for use. The present main drain should be replaced by a nine-inch pipe drain carefully laid and well closed at the joints. Macfarlane's or Jennings' latrines should be introduced instead of the present trough, and flushed out as often every day as might be found necessary to prevent smell. If fresh water is not available, salt water might be used. The surface of the court between the hospital and the outbuildings should be flagged, and channelled to well-trapped gulleys. The urinal requires renewal.

There are no waterclosets connected with the wards, and the only position in which they could be placed would be in a projection from the front of the hospital opposite the staircase.

*Water Supply.*— There is a tank into which rain water from the roofs is collected for use, but the supply fails after the hot season, and water has to be carted by contract.

More tank space is required, and the only way of increasing the water supply would be to collect it from the hill above, filter it, and store it on higher ground than the hospital, so as to lay it on by gravitation.

With the present method of supply it is impossible to allow the sick sufficient water for cleanliness.

*Ablution and Bath Accommodation.*—None in the hospital. There is a damp dull ablution room with stone benches in the back yard behind the hospital, and a slipper bath in an out-house. It would be a great benefit to provide a fixed bath with hot and cold water laid on, and a small lavatory with two or three sunk basins, in the same projecting building where it is proposed to place the watercloset. The present arrangements are quite unfit for sick men.

*Kitchen.*—The kitchen is in the outbuilding behind. It is small, dark, and not properly ventilated. There are two cast-iron boilers, an open grate, and an oven, but it is stated

that the means are insufficient for varying the diets. A good kitchen range is what is wanted, also light and ventilation through the roof of the building.

There are several deficiencies in the accommodation which require to be supplied. There is no accommodation for orderlies, and they have to sleep among the sick.

The pack store has no racks, and the bedding and pack store require a stove between them to dry the air. The windows into the passage from the medical store and pack store require bars for safety. There is no foul-linen store, and the foul linen has to be kept in the bedding store. The dead-house is a mere lean-to shed with an ordinary window. There is neither purveyor's store nor quarter.

Deficiencies such as these detract seriously from the efficiency of the hospital. They all require to be supplied, but it will be much more expensive to supply them now than it would have been to have included them in the original plan of the building.

### 5.—Fort St. George.

This is an ancient fort about seven miles S.E. of Argostoli barracks, situated on the summit of a conical hill several hundred feet above the level of the sea.

The lofty range called the Black Mountain rises to the height of 4,500 feet at a short distance to the east, and exercises a material influence on the temperature. The climate is cool and healthy, and affords a marked contrast to the hot oppressive air of Argostoli. Fort St. George is used as a place to which troops are sent to recruit, but the position is so favourable for health that a larger garrison might very well be placed in it to relieve as much as possible the troops quartered in the town.

Much of the fort is in a very ruinous condition, but more and better accommodation could be provided in it, at a trifling outlay.

There are at present two barrack rooms in a single block, one over the other, and quarters for two officers.

The barrack rooms are long narrow rooms with windows on opposite sides. The windows are few in number, and too low. They have shutters with small panes of glass in each to give light. More glass is required. The rooms are only wide enough to hold one row of beds. The lower room has earth against its back wall three feet above the floor. This should be cut away to a foot below the floor, and a flagged channel made to carry off the rain water. The upper room is a much better one. Neither room has any ventilation.

The lower room requires a shaft carried up by the wall near the middle of its length, to above the roof, and two inlets on each side close to the ceiling to admit air. The upper room should have a louvre in the middle of the roof and two inlets on each side. There are no fireplaces.

The barrack accommodation might be extended by repairing a large room close to the present barrack. This room has earth against one of its sides, which ought to be cut away, to at least a foot below the floor, and the space flagged and drained. The present stone floor should have a wooden floor placed over it with free ventilation below. The room would require ridge ventilation, and also a very large window in each gable to light the interior. This would afford plenty of space for as much barrack accommodation as would be required, and the site is admirably adapted for it, so far as health is concerned.

There are one or two married quarters in old arched rooms in the fort buildings.

If the barrack accommodation were extended to enable as many men to be removed from Argostoli as could be dispensed with there, additional serjeants' quarters, together with a few married rooms and a women's wash-house, would be required at Fort St. George. There is plenty of space for these buildings.

All the drainage is on the surface; the latrines are built over the edge of the escarp and the wall is filthy in consequence. It would be easy to remedy this evil and to provide against nuisance by projecting the latrine further out from the wall. But if the barrack accommodation were extended, latrines suitably drained would have to be constructed.

Water is derived from several ancient tanks under the works. They require cleaning out. The slopes for supplying rain water to them should be currented, and filters should be provided to pass the water through before it enters the tank. By this means a sufficient supply of water would be obtained.

There is no ablution room.

The cook-house is dark and unventilated. It has two boilers and no other means of cooking. Steel boilers and an oven should be provided.

The situation of this fort offers so favourable a contrast as regards health to the position of Argostoli barracks that it would be well worth while to improve and extend the barrack accommodation in the manner we have advised.

### 6.—Luxuri Detachment Barrack.

The town of Luxuri is a small sea-port on the west side of the gulf, about 5 miles from Argostoli barracks. It occupies a low flat part of the coast, with patches of stagnant sea water and a considerable amount of decaying vegetation in front of it. It is a very filthy place, without drainage or proper water-supply; the paving rough, and the surface drainage consisting of foul open gutters. The barrack is close to the sea, and is a square hired building in two floors, the upper one used as a barrack room for 20 men. In the lower floor is the guard room, cook-house, and ablution room, separated from the men's room above only by the thin boarding of the floor. The barrack room is reached by a ricketty outside wooden stair. It is nearly square, and has windows on all sides, with roof ventilators. The beds were rather crowded along the wall, but otherwise there was sufficient floor area and cubic space for the men.

The *Ventilation* was also sufficient.

*Drainage.*—None, except on the surface, and the paving in a very bad condition.

*Latrine.*—A dark unventilated shed with a bar placed over a hole to which the sea has access. It stands across the street midway on the quay between the barrack and the sea. The arrangements are most offensive and objectionable.

*Water Supply.*—None; all has to be carried by contract.

*Ablution Room.*—This is on the ground floor of the barrack. It has a stone bench and stone floor badly paved on which the foul water lodges. It is both damp and uncomfortable. There is no bath.

*Cook-house.*—Also under the barrack. It is in a bad state of repair, especially the floor. There are rectangular boilers and an oven, the latter not used.

The only favourable point in this barrack is its exposure to the sea breeze. It is one of the most uncomfortable places we have seen, and is more like a temporarily occupied detachment station during war, than a place where British troops ought to be barracked in time of peace.

If Luxuri is to be considered a detachment station, it ought to have a proper barrack constructed for 20 men with the requisite conveniences.

The town itself requires thorough sanitary improvement. It is in a disgraceful state at present.

### 7.—Hospital, Luxuri.

This place consists of three dark unventilated rooms rented in an old house not fit for human habitation, situated on the bank of a muddy creek in a low damp malarial position. It is surprising that any one could have entertained the idea of using such a place either for sick or for convalescents.

It is quite unnecessary to say anything more about it.

We looked at a new house which it was proposed to rent instead of this place. The position was bad, but the rooms were suitable, so far as rooms built for a private dwelling can be suitable for sick. There ought not to be many sick out of so small a detachment; but we were told that convalescents require to be sent for recovery from Argostoli to Luxuri. If such be the case we can only say that Luxuri is a most unfit place for such a purpose, and the statement speaks very badly for Argostoli hospital. Fort St. George would afford a much better convalescent station than Luxuri, and it would be free from the malaria which infects that filthy town.

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## VI.—ZANTE.

### 1.—Topography and Climate.

Zante is a triangular-shaped island about 22 miles long by 12 miles broad, lying about 10 miles south of Cephalonia. Along its west coast it is hilly, and to the eastward from these hills there extends a very fertile plain, running from N.W. to S.E., about four miles broad and 12 miles in length. At the south-eastern extremity of this plain, overlooking the sea, are two hills, one Mount Scopos, rising about 1,500 feet above the level of the sea; and the other, distant about four miles to the north, is the castle hill of Zante, about 654 feet in height. Between these two heights the coast forms a segment of a circle, along the northern part of which, and extending about a mile and a half in length under the Castle, is the town of Zante.

The island appears to belong chiefly to the tertiary period, and some parts of it abound in fossils. Gypsum occurs in masses at Mount Scopos and elsewhere; the subsoil is

said to be generally marl and clay. There are abundant traces of volcanic action here as in other islands of the group. Some portions, as for example about Zante castle, appear as if they had been shaken to pieces by earthquakes. The soil is cleft by deep narrow ravines many acres in extent, the sides of which are damp from filtration of water, and they are probable sources of malaria.

The island is extensively cultivated, perhaps the best so of all the Ionian group. It is covered with currants, olives, oranges, &c. Here as elsewhere improved health has been observed to follow on improved cultivation.

There are no large swamps or marshes to affect the purity of the general atmosphere of the island. Whatever malaria exists is of local origin; and unfortunately there are still numerous patches of wet, uncultivated ground, and stagnant water, to which local diseases are distinctly traceable, besides the damp ravines and hill sides near the town.

*Climate.*—The only instrument for making meteorological observations is a thermometer, and the only data as to climate we have been able to obtain, are the following observations for one year 1859-60.

| Months. | Mean Temperature. | Wind's Direction. | Weather. | Rainy Days. |
|---|---|---|---|---|
| | ° | | | |
| January - - - | 51·5 | Northerly | Pleasant | 9 |
| February - - - | 51·0 | Southerly | Cold and Wet | 15 |
| March - - - | 54·0 | Northerly | Cold and Windy | 14 |
| April - - - | 58·2 | E.N.E. | Fine | 1 |
| May - - - | 65·3 | E.S.E. | Do. | 1 |
| June - - - | 69·5 | E.S.E. | Do. | — |
| July - - - | 75·5 | E.N.E., E.S.E. | Do. | 1. Thunder. |
| August - - - | 76·5 | Do. Do. | Do. | — |
| September - - | 67·3 | N.W., S.E. | Do. | 4 |
| October - - - | 66·0 | S.W., N.E. | Do. | 1 |
| November - - | 60·0 | S.E., N.E. | Do. | — |
| December - - - | 53·0 | N.E. | — | 9. Two shocks of an earthquake; much thunder and lightning. |

As regards the general character of the climate. There are occasional high winds. When winds are northerly the air is dry and bracing, though sometimes piercingly cold in winter. A southerly wind produces a moist state of the atmosphere. In summer there is great heat, but not oppressive unless the wind blows from the south at the same time. This wind (the sirocco) causes languor and headache, but no distinct disease. The summer heat appears to increase the prevalence of continued fever, and also the tendency of this form of fever to pass into typhoid.

Fevers are most prevalent from June to October inclusive, July appearing to yield the largest proportion of cases.

Chest affections are most prevalent in January, February, and March, and bowel complaints between June and October.

Taken as a whole the climate of Zante is a healthy one.

## 2.—Mortality and Diseases of the Native Population.

We have given in Appendix 17 the only account of the mortality and diseases of the island we have been able to obtain. It was kindly prepared for us by the Director of Health, from such statistical data as exist in his department, at the request of Sir Henry Storks, the Lord High Commissioner, who was himself present at our inquiry and accompanied us on our inspection of the town. There appears to be no proper registry of deaths, so that the relative proportion of mortality occurring from different classes of disease cannot be ascertained, and we have considerable doubts likewise whether the return contains all the deaths.

The following are the general results of this return:—

The mean population of the island during the five years 1856-1860 was in round numbers 38,000, and the total mortality 4,405, giving a mean mortality of 881 deaths per annum. The mortality was distributed as follows:—

In the town of Zante, with a population of 15,000, there died during these five years 2,230 persons, or 446 per annum, affording a death rate of 29·7 per 1,000; and in the country, with a population of 23,000, there were 2,175 deaths, or 435 per annum, the death rate being in this case nearly 19 per 1,000.

The prevailing causes of mortality are not given, but the prevailing diseases in the island are gastric, and gastrico-bilious fevers; intermittent and remittent, sometimes assuming the character of pernicious remittent fever; and also typhoid fever. These fevers are most frequent in summer and autumn, and after a wet spring they take on an epidemic character. They chiefly occur among the inhabitants at the two extremities of the town, and are attributed to stagnant water at the southern extremity, and to stagnant air caused by the hills at the northern extremity. These diseases likewise occur in the country, and are confined to situations where there is want of drainage, and stagnant water.

Besides fevers there are inflammatory diseases, such as bronchitis, pneumonia, dysentery, diarrhœa, and acute rheumatism. Exanthematic fevers, and diphtheria occur sometimes sporadically, sometimes epidemically. Croup is a very rare disease. Cases of tubercular consumption often occur. Calculus is of rare, gravel of more frequent occurrence.

In certain villages cases of Greek elephantiasis show themselves.

The general sanitary state of the country is said to be improving under extended cultivation and other sanitary ameliorations; but it is evident that the most frequent diseases are still those connected with neglect of drainage, overcrowding, bad ventilation, and generally defective sanitary police.

We next proceed to state very generally the condition in which we found the town.

### 3.—Sanitary State of Zante (Town).

The town consists of a long narrow strip of houses, 2,500 yards in length, by from 200 to 300 yards in breadth, built on the flat shore under the castle, and extending southward in the direction of Mount Scopas. Part of it is also built on the slopes of the castle hill. The main street and quays run nearly north and south, and as seen from the bay the town has a much better appearance than most other Ionian towns. It consists essentially of a single long principal street, with narrower shorter streets running parallel to it, and a number of narrow lanes crossing these streets at right angles.

Many of the houses are of a superior character, but the greater number of them, inhabited by the mass of the population, are like other houses of eastern towns, crowded with people, badly ventilated, and dirty.

The streets and alleys in the poorer quarters are narrow, tortuous, and not arranged so as to admit air currents freely among the houses. This customary defect in Levantine towns can only be removed by building wide straight streets through the worst parts of the town to admit of a free passage for the sea breeze in all directions.

Above the eastern end of the town, and close to it, rises the massive lofty hill on which the castle is situated, with other high ground to the northward, which intercept all north-west winds from the houses. The drainage from the porous strata of which the hill is composed, penetrates towards the lower levels on which the town is built. To the southward the shore is low and flat; the line of houses rising almost directly from the water. The natural outlet for the drainage of much of the higher cultivated ground behind the town, is across this part of the town.

There is some low land in this direction under water in the rainy season, to which malaria is said to be attributed by the inhabitants.

The position of the town taken as a whole cannot be considered as naturally healthy, and certainly no sufficient precautions have been adopted as regards drainage and other sanitary works to diminish its liability to malaria. In all similarly situated towns an undrained subsoil, especially if it happens to be porous, or large sections or declivities of damp porous rock, or of earth, are just as prolific sources of malaria as undrained marshy land.

The principal defect in the town is indeed the condition of the drainage, and of the outlets. There are several sewers carried across the breadth of the town, which open into the port. These sewers have been apparently constructed without any knowledge of the principles of town drainage. As we saw them they were large conduits partly ruinous at their mouths, and allowing their contents to run in the open air before mixing with shallow sea water in the port. For some distance round the openings there were accumulations of filth and decaying substances, darkening the sea water, and causing great nuisance from decomposition. The sewers were much too large, and were evidently not properly supplied with water to keep them clear.

The margins of the port are shallowing from deposit of various kinds, and unless steps be taken to remedy the evil by proper quaying, and by deepening the water, the public health will certainly suffer.

The household conveniences are said to be of a very defective kind. There are very few latrines, and those of a rude unhealthy kind.

We would strongly recommend that the sewerage and drainage of the whole town be examined by a competent sanitary engineer, and a plan drawn up for gradually draining the site itself as well as the houses.

The surface drainage and paving are not so good as they ought to be.

The paving is usually very rough, and the channelling not sufficient for carrying off water rapidly. The surface cleansing is not sufficiently attended to. A water supply has been brought into the town, but we have not been able to obtain any satisfactory information about either its source, quantity, or quality. It is laid on to public fountains, but not to any extent to private houses. It is evidently not laid on in connection with the town drainage.

One of the most painful sights we ever saw is the civil hospital of Zante. It is part of a two-story building situated in a narrow street close to the shore at the northern end of the town. The ground floor of this building is the hospital, the upper floor is another institution.

A narrow dark passage in the middle of the ground floor gives entrance right and left to the wards. They are low, dirty, narrow, unventilated rooms, without any conveniences for the care or treatment of sick. Not even a dead-house; for when we were in the place a corpse waiting for interment occupied nearly half the breadth of the entrance passage. The accommodation is supposed to be for 40 beds; but according to the municipal regulations part of the beds are occupied by old people who are invalids. The place therefore partakes of the character of a poor-house, as well as of a hospital. An arrangement repugnant to every feeling of regard either for the sick or for the aged.

The admissions and deaths in the hospital part are given in Appendix 17, from which it appears that during the five years 1856 to 1860, out of 291 admissions there were 70 deaths, equal to 24 per cent of the admissions; an enormous mortality, more like that of a pest hospital during plague than of a general hospital for the reception of all cases.

We have received no account of the causes of death, but the table gives the predominating diseases as intermittent, typhoid, and gastric fevers, rheumatism, syphilis, scrofula, consumption, and dropsy;—diseases which, with anything like a chance of recovery, ought certainly to afford no such mortality. We must look for the cause of the excess of deaths to the frightful state of the hospital. It is not for us to say who is chargeable with this grievous neglect; but a sense of humanity and regard for the poor renders it necessary for us to state our opinion that not a day should be lost in building a proper hospital for sick and a suitable asylum for the aged and infirm.

The steps now being taken by the Government of Malta in regard to this very question ought to be followed by the local authorities in Zante, and they should at the same time organize a sanitary administration for the execution of sanitary works and for the prevention of disease.

### 4.—Mortality and Diseases among the Troops.

Zante has afforded in times past a very high average mortality among the troops. For the 20 years preceding 1836, the deaths were in the ratio of 32 per 1,000 out of an average strength of 397 men. Of this high ratio 17·6 deaths per 1,000 were due to fevers. Nearly two-thirds of the fever deaths were due to remittent and about one third to continued fever. There were only four deaths reported from intermittent during the entire period of 20 years.

After fever the next most fatal disease was dysentery, the annual mortality from which was as high as 4½ per 1,000 strength. Next in fatality was consumption and chronic catarrh, which gave a death rate of above 3·2 per 1,000.

During the succeeding 10 years the average strength was 280, and the average death rate was 19·6 per 1,000. The rate varied much in different years. In 1841, when the number of men at the station exceeded that of any other year of the period, the death rate was as high as 40·2 per 1,000. It is worthy of remark that in 1843, the year when the force was smallest, the death rate fell to 9 per 1,000. Fevers, two-thirds of which were of the remittent, one-third of the continued type, occasioned an annual death rate of 7½ per 1,000. Chest diseases, chiefly phthisis and chronic catarrh, occasioned 4·6 deaths per 1,000, and bowel diseases, diarrhœa, cholera, dysentery, a mortality of 2½ per 1,000. We learn from a return (Appendix 18) prepared for us by the medical officer in charge, that between 1st April 1850 and 31st December 1859, there was an average strength in barracks of 394, except during the period intervening between 31st March 1855 and 21st August 1856, when Zante was garrisoned by a militia regiment.

During 8 years and 4 months included in this return, the average mortality among the troops of the line was only 9·7 per 1,000, and the diseases showed a remarkable change in character. There was only one death from remittent fever during the whole

period, but above a third of the mortality arose from continued fever, and nearly half the mortality from continued and typhoid fevers conjointly. Nearly a fourth of the deaths were from chest diseases, chiefly consumption.

The militia regiment suffered severely from cholera. Between 25th October and 21st November 1855, there were 31 of them admitted to hospital for this disease; of whom no fewer then 24 died, seven cases only recovered.

In 1859, the mortality in the garrison was very low, only 6·6 per 1,000, but it is of importance to remark that it was due solely to miasmatic diseases. The year 1860 was a healthy year; there was only one death (from typhus fever) out of a strength of 325. The admissions to hospital amounted to 343, of which 12 were from intermittent, 33 from remittent, 17 from continued, and 8 from typhoid fevers. Admissions from fever were 20 per cent. of the total admissions.

During the first nine months of 1861, up to the time we were in the islands, the average strength of the garrison at Zante was 319, and the admissions to hospital were 210, of which 51 were from continued and two from intermittent fever. During the third quarter of the year, at the time when continued and typhoid fever prevailed at Corfu, there were 88 admissions to hospital at Zante, of which 42 were from continued fever.

The most important diseases in this garrison are proved by these statistics to be of the same character as those which prevail at the other stations in the Ionian islands, and they indicate the operation of the same class of causes in this as in all the other stations.

We next proceed to describe the barrack and hospital accommodation.

### 5.—Sanitary Condition of Barracks.

There are two barracks in Zante, one in the town; the other on the summit of the castle.

Their topographical position is shown in Fig. 33.

Figure 33.—Zante Castle and Town Barracks.

### 1.—*Town Barrack.*

This is an old Venetian building, said to have been originally an hospital, and given over by the Ionian Government for a barrack in 1838. It is situated at the northern extremity of the town, at a short distance from the sea. But the sea breeze is excluded from the building by streets of houses, and by a lofty church forming part of the street out of which the barrack yard is entered. On the side away from the sea the steep slopes of the castle hill rise to the height of several hundred feet, and cut off the north-west winds. The rainfall from the heights above, and the subsoil water gravitate directly upon the ground covered by the barrack, and the foundations of the streets cut across the natural outfall of the drainage toward the sea. The position therefore is not a good one. It is exposed to damp, malaria, and stagnation of air, and cannot be healthy, especially with a large number of men barracked together upon it.

The neighbouring civil population suffers from miasmatic diseases to a considerable extent; and the only way of diminishing their frequency among the troops is either to remove the troops altogether out of the locality, or to put as few men into the barrack as possible, at the same time using every precaution to improve the general sanitary state of the building. But it would be better and cheaper in the end to build a proper barrack in a healthy position; for as long as the present building is occupied the men will suffer more or less from fevers.

The ground within the barrack boundary is an irregular area of 1,822 square yards, mostly behind the church, but part of it at one end of the church where the entrance gate is. The surface soil is gravel and the subsoil marl, which latter also constitutes the mass of the high ground immediately behind.

Along one side of the boundary wall, beginning from the public street, are placed the guard room and cells, privy, cook-house, and wash-house; and the barrack is a square building standing detached within the area.

It is in two floors, entered by a door in the middle of its front. Immediately within the door there is a square hall affording entrance to the ground-floor rooms, and containing a staircase, which gives access to the rooms on the floor above.

Out of the hall on the ground floor are entered a non-commissioned officers' room right and left, a barrack room right and left, and one barrack room in the centre. At the top of the stairs are three barrack rooms, one right and left, and one in the centre.

The construction is rather an uncommon one, and affords on each floor two rooms to the outside wall each, from its position having windows along one side and also at one or both ends, and in the middle of each floor one room with windows only at one end. The whole six rooms and the non-commissioned officers' rooms have community of ventilation by means of the halls and stairs, and foul air passes freely from one room to another throughout the building.

The following table gives the accommodation.

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men at 600 Cubic Feet each. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | ft. in. | ft. in. | ft. in. | | | | | ft. in. | ft. |
| 2 | 23 | 44 10 | 20 1 | 12 8 | 496 | 35 | 19 | 4 | 6 10 | 4 |
| 3 | 22 | 36 6 | 20 1 | 12 8 | 422 | 33 | 15 | 2 | 6 10 | 4 |
| 4 | 23 | 44 10 | 20 1 | 12 8 | 496 | 35 | 19 | 4 | 6 10 | 4 |
| 6 | 30 | 58 0 | 20 1 | 12 10 | 499 | 39 | 24 | 6 | 6 10 | 4 |
| 7 | 24 | 36 6 | 20 1 | 12 10 | 392 | 30 | 15 | 2 | 6 10 | 4 |
| 8 | 30 | 58 0 | 20 1 | 12 10 | 499 | 39 | 24 | 6 | 6 10 | 4 |
| Total Men - | 152 | — | — | — | — | — | 116 | — | — | — |
| 2 Rooms, Non-commissioned Officers' - | 1 | 20 1 | 13 0 | 12 8 | 3,307 | 261 | — | 2 | 6 10 | 4 |
| Guard Room - | 20 | 28 0 | 16 0 | 15 0 | 336 | 17 | 11 | 2 | 4 0 | 3 |
| Lock-up - - | 4 | 16 0 | 7 0 | 15 0 | 420 | 28 | — | 1 | 5 0 | 4 |
| | | | | | | | | 1 | 3 0 | 2 |

*Overcrowding.*—If we take 600 cubic feet per man as our standard of accommodation, this barrack will hold 116 men instead of 152, but in such a locality and with such a construction as this barrack exhibits it will by no means contain 116 men and keep them in health. The superficial area per man should be at least double what it is, and hence 76 men is the largest number the barrack ought to contain.

*Ventilation.*—The window space in the middle rooms is deficient, but this cannot be remedied. The lower rooms have ventilating shafts in the walls, and the upper rooms have openings in the roof, but they are not sufficient to keep the air pure at night, and when we were there all of them were closed up. The only remedy for this defect is to introduce shafts and inlets constructed on the principles shown on Plan X., Fig. 2.

The proportion of sectional area for outlets and inlets to cubic contents required for Zante barracks is that laid down in the first part of this report; and in improving the ventilation of these rooms the present extent of inlet and outlet for each room should be increased, if necessary, up to the amount specified above. All the openings of both outlets and inlets inside the rooms should be louvred, to throw any stray currents up to the ceilings. This precaution is the more necessary on account of the local position of the building, and the probability there is of the wind beating down upon it from the hill side above during high winds. If after these improvements are carried out the ventilation is still insufficient at night, additional inlets should be made close to the ceilings.

*Drainage.*—The drainage of the barrack ground is on the surface towards one or two underground drains; much of it sinks into the subsoil. Part of the surface is well paved.

The surface drainage within the latrines was very bad. Foul putrescent liquid was lying on the surface, and we were told that illness had been sometimes traced to this cause.

There is a covered sewer for rain water which joins the sewer leading from the privies near the gate to the sea. The latter is no less than 2 feet 3 inches high, by 2 feet wide; square in section, and arched over; the worst of all forms for a drain: and in this instance the size is so large that the sewer is nothing but a long cesspit, in which the privy soil accumulates till it is flushed ont, creating great nuisance, and constantly endangering the health of the men. Into this sewer the other drains all empty.

*Latrine.*—The latrine is simply a large trough at the head of the drain. It is washed out only three times a week. When we saw the place it was in a most offensive condition.

The surface drainage of the latrine requires to be properly attended to, so that no water shall lie on it. As regards the sewer, the best thing to do would be to replace it by a 9-inch pipe drain. The distance to the sea is only 70 yards. The present latrine should be replaced by one of Macfarlane's or Jennings', and flushed out once or twice a day, according to the season.

Adjoining the latrine is a bad porous stone urinal, also a nuisance. It should be replaced by one of iron or slate, provided with water for cleansing.

The latrine buildings should be lighted and ventilated through the roof.

*Water Supply.*—Water for the use of the barrack is collected from the surrounding heights. There is a tank of brackish water in the yard, and the town supply is outside the gate. Water is not laid on for any purpose, but should be introduced without delay. A raised tank, with a pump to fill it, is required, to afford water for ablution, and also for supplying water for the latrine.

*Ablution and Bath Accommodation.*—This consists of a small triangular apartment built against the boundary wall. It has a door and window, and a stone bench on two sides to set basins on. The foul water is drained from the back of the bench into a vertical pipe communicating with the privy drain. There is no water except what is carried by a fatigue party from the town water supply outside. There are no baths. One would be required for the reduced strength of 76 men recommended above, and water should be laid on to it.

*Cook-house.*—The cook-house is next door to the privy. It has the usual boilers; and brick ovens not used for want of fuel, besides which they appeared to be in bad repair. Steel boilers and an oven should be supplied. Refuse water is poured down a grating communicating with the privy drain. There is no water supply except what is carried by hand.

*Women's Wash-house.*—None. There are iron drying posts.

*Guard Room.*—Both guard room and lock-up are too small. They are lean-to buildings only partially ventilated. Additional roof ventilation is required. There are no cells, a want said to be much felt.

*Officers' Quarters.*—None in town; the house formerly used for the purpose has been given up.

*School Room.*—This is a large room in town, rented for a chapel and school.

## 2.—*Zante Castle Barracks.*

*Zante Castle* occupies the summit of a steep hill 654 feet high, rising directly from behind the houses of Zante at the north end of the town, and overlooking the sea and nearly the whole island.

The summit is inclosed by old walls, surrounding an area of 20 acres and 3 rods. The surface soil is a reddish clay, resting on a subsoil of blue clay and marl; by no means a healthy soil in a warm moist climate. The ground within the walls is at different elevations, some buildings being many feet higher than others. But the whole surface is exposed to every wind that blows, and sometimes the winds are very high. No malaria can reach the castle except such as may rise in still warm weather from the numerous deep damp ravines descending from it on nearly all sides.

The south point of the castle is the most elevated, and from thence the ground slopes towards the north. All the buildings are on this slope, they consist of officers' quarters, barrack rooms, hospital, chapel, school, library, stores of various kinds, married quarters, guard room, cells, &c.

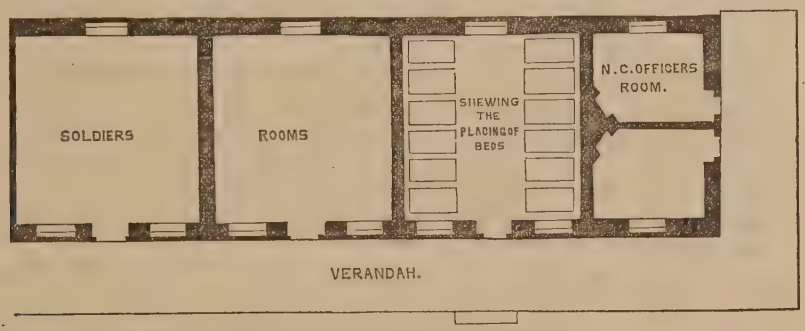
A number of the existing buildings are of recent construction, and were erected to supply the accommodation destroyed by the earthquake of 1840. The others are buildings of an older date, some of them partly ruinous, and there are two or three old chapels now used for military purposes.

The principal barrack accommodation is in a recently constructed, long, one-floor building with an open roof and a verandah along the south side. It is the most elevated of the barracks, and is divided transversely into a number of men's rooms, each having its separate door from the verandah, with a window on each side the door, and a window at the end opposite the door.

Each division has regulation space for 12 beds, six along each side. At one end of the range are two non-commissioned officers' rooms, and there is another non-commissioned officer's room with an orderly room at the opposite end. The whole range is 213 feet 6 inches long, and 25 feet wide exclusive of the open verandah. This building is known as barrack C.

A ground plan of a portion of it is given in Fig. 34.

Figure 34.—Ground Plan showing the General Construction of C. Barrack, Zante Castle.




A few yards from the western end of barrack C., and built at right angles to it, is another single barrack room E., for 30 men. Barracks D. and F., one room each, are further down the hill. There are in all 11 barrack rooms, with regulation space for 174 men; and four rooms for one non-commissioned officer each.

The following table gives the details of this accommodation :—

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men at 600 Cubic Feet each. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | ft. in. | ft. in. | ft. in. | | | | | fti | ft. in. |
| C. 8 Rooms - | 12 | 21 0 | 21 0 | 14 6 | 533 | 37 | 10 | 3 | 7 0 | 3 6 |
| D. 1 Room - | 20 | 39 0 | 14 6 | 11 3 | 314 | 28 | 10 | 3 | 4 9 | 2 10 |
| E. 1 Room - | 30 | 61 3 | 20 1 | 13 0 | 533 | 40 | 26 | 7 | 4 3 | 3 0 |
| F. 1 Room - | 28 | 47 4 | 16 6 | 11 8 | 325 | 28 | 15 | 4 | 5 0 | 3 3 |
| Total Men - | 174 | — | — | — | — | — | 131 | — | — | — |
| C. 4 Non-commissioned Officers' Rooms - | 1 | 14 0 | 10 1 | 14 6 | 2,047 | 140 | — | 1 | 7 0 | 3 6 |

| Rooms. | Regulation Number of Men per Room. | Dimensions of Rooms. | | | Cubic Feet per Man. | Superficial Feet per Man. | Number of Men at 600 Cubic Feet each. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| *Guard Rooms.* | | ft. in. | ft. in. | ft. in. | | | | | ft. in. | ft. in. |
| Magazine - | 10 | 14 3 | 12 0 | 9 6 | 162 | 17 | 3 | 1 | 3 6 | 2 6 |
| Castle Gate - | 10 | 16 9 | 16 0 | 11 0 | 295 | 27 | 5 | 1 | 2 6 | 2 0 |
| *Cells.* | | | | | | | | | | |
| 5 | 1 | 13 0 | 7 0 | 7 6 | 682 | 91 | Hard Labour | 1 | 1 3 | 3 6 |
| 1 | 1 | 8 9 | 8 9 | 7 6 | 570 | 76 | Solitary | — | — | — |
| 1 | 1 | 10 0 | 8 9 | 7 6 | 656 | 87 | | | | |
| 1 | 1 | 10 6 | 6 0 | 7 6 | 472 | 63 | | | | |

*Overcrowding.*—By giving as nearly as may be 600 cubic feet per man these rooms will hold 131 men, or 43 fewer than their present allotment. This is the largest number they ought to contain. In so exposed a position, and with good ventilation, there should be no danger of overcrowding with this number.

The overcrowding in the guard rooms is excessive, and is the greatest we have ever met with. How can men be healthy who have to pass a period of disturbed rest during every 24 hours they are on duty in 162 cubic feet of space and 17 square feet of surface? New guard rooms are required, for the present ones will not hold half the requisite number of men.

*Ventilation.*—None of any consequence, except doors and windows. There are no fireplaces. Barrack C., with 12 beds arranged along the wall, six on each side between the opposite windows, is not well constructed for ventilation. It would have been very much better to have had the windows along the same sides as the beds. In the other barracks this is the case. The rooms of all the barracks have open roofs, with one exception.

To ventilate them properly each room in barrack C. should have a louvred shaft in the middle of the ridge, and one inlet at each end at the eaves.

The other rooms require two louvres each at equal distances along the ridge, and three inlets along each of the opposite sides at the eaves.

*Drainage.*—The entire drainage of the castle is on the surface by rubble-paved drains, many of them very uneven and having foul water lying in them. In one such drain under a barrack window there was putrid urine and other noxious matters.

At the lower end of the slope near the gate the surface drainage is received into brick underground drains, and passed through the works, to escape as it best may.

The privies are all undrained, and are over cesspits, which are said to be emptied periodically by contract.

In one exceptional case the privy is constructed over the edge of the scarp without any provision of the kind. In one instance the cesspit is at the foot of the scarp. The soil is conveyed to it by a pipe, and when we were there it was undergoing cleansing which consisted in simply drawing the putrid fluid out of it and throwing it down the slope. This was done by permission of the barrack master, notwithstanding the terms of the contract, which exact removal of the matter.

The process gave rise to an abominable and dangerous nuisance. These cesspits are simply intolerable in such a climate. They are by no means unimportant agents in predisposing men to continued and typhoid fevers, although only exposed temporarily to their emanations.

The latrine attached to the officers' quarters is merely a wooden shed, over a cesspit in a hole in front of the mess room. The surface drainage of the neighbourhood finds its way into this place, and no doubt percolates into the porous subsoil, finding a convenient outlet probably into some water-tank at a lower level.

Zante castle requires drainage, and all the latrines require to be reconstructed on Macfarlane's or Jennings' principle and flushed out daily. Either the fluid must be carried down the slope of the hills to a sufficient distance, and used to irrigate waste land, of which there is plenty; or it should be collected in an iron tank at the lowest possible level, and removed by a cart; or else a pipe drain should be carried down the slope to the sea.

The surface drains should be better made, and proper channelling should be laid down.

*Water Supply.*—Water is obtained from surface drainage, which supplies tanks and wells after being filtered. The tanks can hold 157,000 gallons, besides that obtained from the wells. During dry weather the water runs short, and is observed to contain impurities.

Water has then to be supplied by contract. The total cost of this extra water in 1856 was 94*l.* 0*s.* 3*d.* for the station. (Appendix 11.)

The quantity of water could be increased to any necessary extent by collecting all the roof water and as much additional surface water as might be required. It would all have to be carefully filtered.

The means of raising and distributing the water for use are rude and imperfect. There is only one pump. At all the other tanks and wells a cord and pulley are used, and every drop of water has to be carried to its destination by hand. There is no such thing as a water-pipe. The system of raising water from tanks by a rope and bucket is highly objectionable on account of the impurities which find entrance to the tanks. Every tank should have a pump.

*Ablution and Bath Accommodation.*—This is a small stone building with a stone floor, a stone bench for basins, and a 250 gallon tank for holding water, all of which has to be drawn and carried by hand labour for a distance of 25 yards. The ablution room is situated between the two largest barracks at the higher end of the ground.

The waste water from the ablution room passes into an open pit, which overflows into the adjacent urinal, whence it runs, together with the urine, into the open surface gutter already alluded to under the barrack room windows, to the front of the cook-house, and thence to the escarp wall, down which it trickles.

The ablution room has no ventilation, and no bath.

A louvre should be placed in the roof; water should be laid on to the tank by means of a pump; and if it be possible to afford water for the men even for one bath a week, it would be of great importance to cleanliness to do so. This could only be done, however, by collecting all the roof water, and more of the surface water, and by placing tanks at a sufficient elevation to deliver the water by pressure.

*Cook-house.*—The cook-house is situated at the upper end of the castle area, at no great distance from the ablution room.

It is supplied with boilers, oven, and a fireplace. The oven is never used because the fuel ration is insufficient on account of imperfection of the apparatus. There is no water laid on, and no drainage, except by an open gutter. Water for cooking has to be carried from a tank. The cooking apparatus is not in good condition, and the cook-house requires roof ventilation.

The artillery cook-house is a small apartment with only a single boiler. These cook-houses require steel boilers and a steel oven.

*Women's Wash-house.*—This is also a small room next the cook-house; it has no conveniences except a fireplace and a bench. There are drying posts outside.

*Married Quarters.*—Besides the quarters for non-commissioned officers in the barracks, there are two or three quarters in a detached hut lower down the hill. The former contain each one room, they are good so far as the extent of accommodation goes; each room having a separate door, window, and fire-place. The others are not so good.

*Means of Instruction and Recreation.*—There is a ball court, and a skittle alley under a ruinous wooden shed.

There is a small library and reading room with games, over a stable, smelling strongly of ammonia. It has no table, and is by no means a sufficiently attractive place. It requires great improvement. There are two schools for the station.

There is no gymnasium, and no shade except one verandah. The means of recreation are deficient.

*Guard Room and Cells.*—We have already pointed out the enormous overcrowding in the guard rooms; but besides this they have no ventilation, and there is no lock-up. The cells on one side the court have openings only over the door. They require shafts at the ends. There is no ablution room attached to them, and they are much too small for health in such a climate.

### 3.—Hospital, Zante Castle.

This hospital receives sick from both castle and town barracks. It is situated close to the defences on the east side, near the higher end of the castle area, in an airy healthy locality. It is a long one-story building within an inclosure; having a verandah on three sides, and a range of out-offices behind. The floors are raised to admit of a passage of air beneath them. There is a quarter for the surgeon at one end, and a quarter for the hospital serjeant, together with the surgery at the opposite end. These have separate entrances. A passage traverses the building from front to back, and a short corridor within, on each side, gives access to the wards.

The apartments nearest the passage are, one of them used as a store, the other which is of the same dimensions is used as a ward. These rooms have each one window at one

end. The other two rooms, which are both of the same size, are used as wards, and have two windows at each of the opposite ends; the beds are arranged with their heads along the dead walls between the opposite windows. The accommodation is as follows:—

| Wards. | Regulation Number of Beds. | Dimensions of Wards. | | | Cubic Feet per Bed. | Superficial Feet per Bed. | Number of Beds at 1,200 Cubic Feet each. | Windows. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Length. | Breadth. | Height. | | | | Number. | Height. | Width. |
| | | ft. | ft. in. | ft. in. | | | | | ft. | ft. in. |
| No. 1 - - | 4 | 25 | 12 0 | 12 2 | 912 | 75 | 3 | 1 | 7 | 3 6 |
| 2 - - | 11 | 32 | 22 0 | 12 2 | 778 | 64 | 7 | 4 | 7 | 3 6 |
| 3 - - | 11 | 32 | 22 0 | 12 2 | 778 | 64 | 7 | 4 | 7 | 3 6 |
| Total, 3 - - | 26 | — | — | — | — | — | 17 | — | — | — |

*Overcrowding.*—In a small hospital such as this, and on so airy a site, 1,200 cubic feet per bed ought to be enough of space, and at this rate the building ought to contain 17 beds, in place of 26, its present number. The accommodation required to complete the hospital space, could be obtained by extending the two ends of the building and converting them into wards, and by constructing a separate surgery, quarters, and stores.

*Ventilation.*—The structure of the building is not favourable to ventilation. It would have been much better to have had the windows along both sides of the wards instead of at the two ends, and this should be kept in view in adapting the ends of the buildings for sick wards. There are openings in the ceilings, but no proper louvres, and there are no inlets for fresh air. A ventilating shaft, louvred above and below, should be carried from the middle of each ceiling above the roof, and a large inlet should be placed at each end of the larger wards under the eaves. In the smaller wards one inlet will be sufficient, and the shaft should be carried up at the end furthest from the window.

*Drainage.*—This is entirely on the surface, and the outlet is above the level of the yard. The roof water is collected by guttering and discharged into boulder-formed gutters which convey it down the hill. It would be much better to collect all the roof water into an iron tank sufficiently high to receive it and to lay it on for hospital use.

The *Latrines* are simply open privies over cesspits, a few yards behind the hospital. Both latrines and urinal are very offensive, and are a serious nuisance to the patients. They require reconstruction as water latrines, and the drainage from them should be connected with the general system of drainage for the castle. There are no waterclosets.

*Water Supply.*—Same as that of the barracks, and requires similar extension, and improvements in distribution.

*Ablution and Bath Accommodation.*—This is outside the hospital, and is of the common barrack construction. There is only a slipper bath and a shower bath, with a boiler for heating water. The arrangement is insufficient. In enlarging the hospital provision should be made for one fixed bath and a proper ablution table.

*Kitchen.*—The kitchen is behind the hospital. It contains an oven, a copper boiler, and a fireplace. These means are not sufficient for varying the diets, and a suitable hospital cooking range should be provided.

*Orderlies' Rooms.*—None, except the small ward misappropriated for the purpose. Only the hospital serjeant has a quarter, but it is outside the hospital. The deficiency is very much felt, and can be provided for in altering the building.

*Storage.* –Very deficient. There is only one room for all purposes, and the room is really deducted from the hospital accommodation. When we were there the dead-house was used as a foul bedding and wood store.

There is no purveyor's quarter.

Such as it is, this hospital is one of the best in the command, but it is wanting in many things required for the treatment of sick.

It would be a great relief at this station to have a single room for sick wives and children of soldiers, especially for midwifery cases.

In this our report on the sanitary condition of the Mediterranean stations we have endeavoured to give a sufficiently detailed account of the existing sanitary defects, and the principles on which improvements should be carried out to enable these defects to be remedied. The work is one of no ordinary magnitude and importance. Our examination of these stations has clearly shown what are the local causes which have so powerfully contributed in times past to those outbreaks of pestilence from which troops and civilians have alike suffered. Considerable expense will have to be incurred before the garrisons can be considered safe from future visitations of these diseases; but this is unavoidable.

The first and most necessary work, and the one in which the smallest relative cost will be incurred, is ventilation of barracks and hospitals.

Next should follow drainage and water supply, not because they are less important, but because they involve the introduction of special arrangements requiring time.

After these must follow the very important question of additional barrack accommodation.

All the hospitals require to be improved without delay. We have already prepared plans for the re-arrangement of the hospital at Gibraltar and for new hospitals at Malta, which are works of immediate necessity; and we would strongly recommend that the erection of the proposed new hospitals be proceeded with at once. Whatever cost it may be necessary to incur for the improvements we have advised will be money well laid out, and will be amply repaid by diminished sickness and increased efficiency among the troops serving in these important garrisons.

DOUGLAS GALTON.
JOHN SUTHERLAND.

J. J. Frederick, Secretary,
War Office, 12th January 1863.

# APPENDIX TO REPORT ON GIBRALTAR.

## No. 1.

### R.E. Meteorological Observatory at Gibraltar.

Latitude 36° 6′ 23″ N. Longitude 5° 20′ 53″ W. Height above the sea, 46 feet.
Corrected in 1858 to Latitude 36° 6′ 20″ N. Height above the sea, 50 feet.

Annual Register, compiled from the Results of the Monthly Observations.

**1852.**

| Months. | Barometer. | | Thermometer. | | | | Hygrometer. | | Rain. | | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9.30 A.M. | 3.30 P.M. | In Sun. | In Shade. | | | Dew Point. | Humidity. | On the Ground. | 25 Feet above. | |
| | | | Max. | Max. | Mean. | Min. | | | | | |
| January | Observations not commenced. | | | | | | | | | | |
| February | 30·093 | 29·993 | 83·5 | 71·0 | 57·3 | 43·0 | 46·3 | ·705 | 3·59 | 6·31 | N.W. |
| March | 29·922 | 29·906 | | 73·6 | 58·1 | 44·6 | 52·1 | ·784 | 7·02 | 12·10 | N.W. |
| April | 29·967 | 29·938 | | 74·0 | 62·0 | 52·0 | 54·5 | ·721 | 2·82 | 2·71 | N.W. |
| May | 29·992 | 29·944 | | 80·5 | 66·0 | 49·0 | 57·0 | ·690 | 1·60 | 1·51 | S. |
| June | 30·030 | 29·996 | | 83·5 | 70·4 | 57·0 | 60·5 | ·659 | No rain. | | S. |
| July | 29·982 | 29·945 | | 90·8 | 75·1 | 61·8 | 65·2 | ·643 | No rain. | | N.W. |
| August | 30·035 | 29·998 | | 87·9 | 74·3 | 60·6 | 64·0 | ·666 | ·36 | ·36 | S. |
| September | 30·028 | 29·976 | | 85·0 | 72·0 | 54·0 | 64·0 | ·707 | ·04 | ·01 | N.W |
| October | 30·030 | 29·986 | | 81·6 | 68·6 | 55·6 | 61·2 | ·778 | 3·88 | 3·0 | N.W. |
| November | 30·020 | 29·973 | | 69·8 | 62·9 | 44·0 | 57·4 | ·798 | 5·51 | 5·18 | N.W. |
| December | 30·170 | 30 ·122 | | 66·3 | 57·0 | 43·5 | 52·6 | ·777 | ·06 | ·05 | N.W. |
| Sums | 330·270 | 329·747 | Thermometer unserviceable. | 863·4 | 724·4 | 576·5 | 634·8 | 7·888 | 24·80 | 31·23 | — |
| Results — Max. | 30·093 | 30·022 | | 90·8 | 75·1 | 61·8 | 65·2 | ·798 | 7·02 | 12·10 | — |
| Results — Min. | 29·967 | 29·906 | | 66·3 | 57·0 | 43·0 | 46·3 | ·643 | — | — | — |
| Results — Mean | 30·025 | 29·977 | | 78·5 | 65·9 | 51·4 | 57·7 | ·717 | — | — | N.W. |

*February.*—5th, gale of wind from W. and E.; pressure 14 lbs.; barometer about 29·7. 25th, severe thunderstorm between 2.30 and 3.30 A.M.; wind N.N.W.

*March 6th.* Severe gale with tremendous sea; wind E.; pressure 7 lbs.; tide 2′ 6″ above high water; barometer about 29·7.

*April.*—Pear trees in blossom, and fruit forming on the vine.

*February* and *November* were the most rainy months. The total amount of rain in the upper pluviometer for year was 31·23 inches.

Note.—Greatest height of the thermometer, 23rd *July*, 90·8°. Greatest fall, 24th and 25th *February*, 43·0°. Mean temperature 65·8°. *July* was the hottest month.

ANNUAL REGISTER, compiled from the results of the Monthly Observations—*continued.*

## 1853.

| Months. | Barometer. | | Thermometer. | | | | Hygrometer. | | Rain. | | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9.30 A.M. | 3.30 P.M. | In Sun. | In Shade. | | | Dew Point. | Humidity. | On the Ground. | 25 Feet above. | |
| | | | Max. | Max. | Mean. | Min. | | | | | |
| January - - | 30·107 | 30·051 | Thermometer unserviceable. | 65·0 | 56·8 | 44·2 | 50·1 | ·763 | 4·53 | 4·14 | N.W. |
| February - - | 29·839 | 29·798 | | 65·0 | 51·5 | 39·5 | 42·8 | ·735 | 10·49 | 10·19 | N.W. |
| March - - | 30·058 | 30·012 | | 70·0 | 56·5 | 41·2 | 46·1 | ·683 | 2·51 | 2·44 | N.W. |
| April - - | 30·024 | 29·982 | | 78·2 | 59·0 | 47·2 | 54·2 | ·713 | 1·32 | 1·30 | N.W. |
| May - - - | 29·900 | 29·879 | | 82·2 | 62·7 | 51·2 | 54·0 | ·717 | 6·48 | 6·30 | S.W. |
| June - - - | 30·034 | 30·010 | | 86·0 | 68·9 | 54·5 | 59·8 | ·655 | 0·07 | 0·07 | N.W. & S.W. |
| July - - - | 30·057 | 29·984 | | 88·0 | 74·5 | 61·2 | 66·4 | ·695 | No rain. | | N.W. |
| August - - | 29·959 | 29·918 | | 91·6 | 77·8 | 65·2 | 68·3 | ·672 | No rain. | | N.W. & S.W. |
| September - - | 29·999 | 29·958 | | 84·6 | 73·3 | 60·8 | 65·4 | ·727 | 1·24 | 1·23 | N.W. |
| October - - | 30·029 | 29·982 | | 84·3 | 66·1 | 50·9 | 58·4 | ·747 | 2·59 | 2·55 | N.W. |
| November - - | 29·983 | 29·940 | | 71·3 | 57·7 | 46·7 | 53·0 | ·760 | 5·56 | 5·45 | N.W. |
| December - - | 29·874 | 29·841 | | 66·4 | 54·8 | 32·7 | 48·0 | ·793 | 11·94 | 11·73 | N.W. |
| Sums - - | 359·862 | 356·455 | | 942·6 | 759·6 | 596·3 | 666·5 | 8·660 | 46·73 | 45·40 | — |
| Results - Max. - | 30·107 | 30·051 | | 91·6 | 77·8 | 65·2 | 68·3 | ·793 | 11·94 | 11·73 | — |
| Results - Min. - | 29·839 | 29·798 | | 65·0 | 51·5 | 32·7 | 42·8 | ·655 | — | — | — |
| Results - Mean - | 29·988 | 29·955 | | 78·5 | 63·3 | 49·7 | 55·5 | ·721 | — | — | N.W. |

*April 9th.*—A moderate gale from N.W.; barometer, 30·156.
*May.*—Unusually cold and damp for the season.
*August.*—23rd to 31st, comet visible in the N.W.
*September.*—2nd and 15th, thunder.
*December.*—31st, ice, $\frac{1}{4}''$ thick; snow on opposite hills; minimum temperature, 32° 7.
*February* and *December* were the most rainy months. The total amount of rain during the year in the upper pluviometer was 45·40 inches.
*August* was the hottest, and *February* the coldest month.

*Note.*—Greatest height of the thermometer, 18th *August*, 91·6°. Greatest fall, 31st *December*, 32·7°. Mean temperature, 63·3°. A comet was clearly visible between 7.30 and 9.30 p.m. from 23rd to 31st of August. On the 24th its right ascension was about 11h. 40m. and its declination 27° N., as taken from observed distances from fixed stars. On the 31st its right ascension was 11h. 19m., and its declination 16° 30′ N.; it set about 12 minutes earlier every evening, its path being inclined to the ecliptic about 61°. The appearance of the nucleus was about equal to that of a star of the second magnitude.

## 1854.

| Months. | Barometer. | | Thermometer. | | | | Hygrometer. | | Rain. | | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9.30 A.M. | 3.30 P.M. | In Sun. | In Shade. | | | Dew Point. | Humidity. | On the Ground. | 25 Feet above. | |
| | | | Max. | Max. | Mean. | Min. | | | | | |
| January - - | 30·110 | 30·061 | Thermometer unserviceable. | 65·9 | 54·6 | 37·9 | 47·0 | ·754 | 5·08 | 4·44 | S.W. |
| February - - | 30·177 | 30·132 | | 68·1 | 55·8 | 35·3 | 46·0 | ·698 | 1·55 | 1·52 | N.W. |
| March - - | 30·237 | 30·185 | | 72·5 | 58·2 | 46·7 | 51·5 | ·774 | 2·43 | 2·36 | N.W. |
| April - - | 30·030 | 29·998 | | 74·6 | 60·8 | 50·4 | 55·8 | ·857 | 6·35 | 6·22 | N.W. |
| May - - - | 29·983 | 29·979 | | 80·5 | 66·0 | 53·2 | 59·0 | ·720 | 1·19 | 1·03 | N.W. |
| June - - - | 30·023 | 30·002 | | 88·5 | 68·5 | 55·2 | 61·9 | ·801 | 1·21 | 1·11 | S.W. |
| July - - - | 29·993 | 29·962 | | 87·3 | 74·0 | 62·0 | 66·4 | ·699 | No rain. | | S. |
| August - - | 29·972 | 29·907 | | 89·0 | 76·4 | 61·5 | 71·3 | ·797 | 1·70 | 1·72 | N.W. |
| September - - | 30·095 | 30·035 | | 84·0 | 73·1 | 60·8 | 69·0 | ·852 | 1·81 | 1·76 | N.W. |
| October - - | 30·068 | 30·043 | | 84·0 | 67·6 | 52·0 | 60·5 | ·754 | ·48 | ·36 | N.W. |
| November - - | 29·944 | 29·959 | | 71·5 | 58·7 | 43·8 | 52·3 | ·779 | 16·49 | 12·46 | N.W. |
| December - - | 30·233 | 30·194 | | 64·5 | 54·7 | 45·0 | 43·5 | ·694 | ·03 | ·03 | N.W. |
| Sums - - | 360·866 | 360·457 | | 930·4 | 768·4 | 603·8 | 684·2 | 9·179 | 38·32 | 33·01 | — |
| Results - Max. - | 30·237 | 30·194 | | 89·0 | 76·4 | 62·0 | 71·3 | ·857 | 16·49 | 12·46 | — |
| Results - Min. - | 29·945 | 29·907 | | 64·5 | 54·6 | 35·3 | 43·5 | ·694 | — | — | — |
| Results - Mean - | 30·072 | 30·038 | | 77·5 | 64·0 | 50·3 | 57·0 | ·765 | — | — | N.W. |

*February 14th.*—Hurricane during the morning.
*November 18th.*—Snow on the Spanish mountains.
*Note.*—*August* was the hottest month, and *January* the coldest. *January* and *November* were the most rainy months. Greatest height of the thermometer, *August*, 89·0°. Greatest fall of the thermometer, *February*, 35·3°. Mean temperature, 64·0°. Total amount of rain in upper pluviometer, 33·01 inches.

ANNUAL REGISTER, compiled from the results of the Monthly Observations—*continued*.

## 1855.

| Months. | Barometer. 9.30 A.M. | Barometer. 3.30 P.M. | Thermometer. In Sun. Max. | Thermometer. In Shade. Max. | Thermometer. In Shade. Mean. | Thermometer. In Shade. Min. | Hygrometer. Dew Point. | Hygrometer. Humidity. | Rain. On the Ground. | Rain. 25 Feet above. | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 30·081 | 30·050 | Thermometer unserviceable. | 65·0 | 54·0 | 40·3 | 45·5 | ·736 | 7·31 | 2·82 | N.W. |
| February | 29·904 | 29·845 | | 70·4 | 57·8 | 47·2 | 49·6 | ·763 | 12·81 | 11·47 | S.W. |
| March | 29·985 | 29·946 | | 70·0 | 57·8 | 44·7 | 48·0 | ·700 | 7·34 | 6·89 | S.W. |
| April | 29·984 | 29·951 | | 77·0 | 61·3 | 47·9 | 52·4 | ·700 | 2·31 | 1·83 | S. |
| May | 29·951 | 29·933 | | 77·7 | 63·0 | 50·8 | 58·5 | ·713 | 5·12 | 4·48 | N.W. & S.W. |
| June | 30·044 | 30·210 | | 84·2 | 67·9 | 48·6 | 58·4 | ·673 | 11·3 | 11·00 | N.W. |
| July | 29·955 | 29·923 | | 91·2 | 74·3 | 63·4 | 65·1 | ·687 | ·01 | ·00 | E. |
| August | 29·989 | 29·948 | | 90·5 | 76·1 | 62·8 | 67·6 | ·712 | 1·60 | 1·50 | E. |
| September | 30·066 | 30·001 | | 79·9 | 69·6 | 59·6 | 64·9 | ·767 | 5·046 | 4·04 | E. |
| October | 30·052 | 30·016 | | 82·1 | 67·9 | 53·5 | 59·6 | ·745 | 7·20 | 7·014 | E. |
| November | 29·856 | 29·811 | | 67·8 | 58·0 | 48·2 | 52·0 | ·781 | 13·478 | 14·41 | N.W. |
| December | 29·922 | 29·876 | | 67·5 | 56·4 | 46·2 | 51·0 | ·800 | 18·05 | 20·09 | N.W. |
| Sums | 359·789 | 359·510 | | 923·3 | 754·3 | 613·2 | 672·6 | 8·774 | 75·84 | 69·35 | — |
| Results — Max. | 30·081 | 30·050 | | 91·2 | 76·1 | 63·4 | 67·6 | ·800 | — | — | — |
| Results — Min. | 29·856 | 29·811 | | 65·0 | 48·2 | 40·3 | 45·5 | ·670 | — | — | — |
| Results — Mean | 29·982 | 29·959 | | 76·9 | 62·8 | 51·1 | 56·0 | ·731 | — | — | N.W. |

*February*.—12th, 4·63 inches rain fell. 13th, Barometer, at 3·30 p.m., 29·9.
*May*.—More rain this season (57·9 inches) than any year since 1796.

*Note*.—*July* was the hottest month and *November* the coldest. *February*, *November*, and *December* were the most rainy months. Greatest height of the thermometer, *July*, 91·2°. Greatest fall of the thermometer, *January*, 40·3. Mean temperature of the year, 62·8°. Total amount of rain in upper pluviometer, 69·35 inches.

## 1856.

| Months. | Barometer. 9.30 A.M. | Barometer. 3 30 P.M. | Thermometer. In Sun. Max. | Thermometer. In Shade. Max. | Thermometer. In Shade. Mean. | Thermometer. In Shade. Min. | Hygrometer. Dew Point. | Hygrometer. Humidity. | Rain. On the Ground. | Rain. 25 Feet above. | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 29·829 | 29·760 | | 67·0 | 56·0 | 47·7 | 50·9 | ·798 | 21·624 | 20·385 | N.W. |
| February | 30·023 | 29·979 | | 68·1 | 55·4 | 46·0 | 50·5 | ·777 | 7·267 | 7·778 | E. |
| March | 29·875 | 29·845 | | 71·2 | 57·6 | 49·0 | 52·6 | ·783 | 4·78 | 3·23 | E. |
| April | 30·057 | 30·024 | 89·0 | 73·5 | 61·1 | 49·7 | 52·7 | ·743 | 2·52 | 1·43 | N.W. |
| May | 30·041 | 29·974 | | 84·2 | 67·1 | 54·0 | 57·1 | ·679 | ·30 | ·15 | N.W. |
| June | 30·015 | 30·045 | | 82·0 | 69·6 | 56·6 | 62·3 | ·751 | ·18 | ·6 | E. |
| July | 30·014 | 29·980 | | 86·9 | 74·3 | 62·9 | 67·0 | ·721 | No rain. | | E. |
| August | 29·999 | 29·964 | | 92·0 | 76·4 | 65·0 | 68·7 | ·725 | ·26 | ·14 | E. |
| September | 30·029 | 29·996 | | 88·7 | 71·8 | 55·9 | 63·0 | ·722 | ·115 | ·23 | N.W. |
| October | 30·123 | 30·092 | | 79·4 | 65·9 | 55·0 | 59·4 | ·764 | 3·41 | 2·97 | E. |
| November | 30·078 | 30·033 | | 72·9 | 59·7 | 45·3 | 50·8 | ·717 | 2·45 | 2·42 | E. |
| December | 30·121 | 30·084 | | 71·9 | 56·7 | 44·0 | 47·7 | ·699 | 2·24 | 2·73 | N.W. |
| Sums | 360·201 | 359·776 | Thermometer unserviceable. | 937·8 | 771·6 | 631·1 | 682·7 | 8·879 | 42·54 | 51·55 | — |
| Results — Max. | 30·123 | 30·092 | | 92·0 | 76·4 | 65·0 | 68·7 | ·798 | 21·624 | 20·385 | — |
| Results — Min. | 29·829 | 29·760 | | 71·2 | 55·4 | 44·0 | 47·7 | ·679 | — | — | — |
| Results — Mean | 30·019 | 29·981 | | 78·1 | 64·3 | 52·6 | 56·9 | ·739 | — | — | E. |

*January*.—Most rain ever recorded in one month at Gibraltar.
*December 26th*.—Gale of wind accompanied by rain at 9½ a.m. ; barometer, 29·6 ; wind W., pressure, 10lbs. The wind veered round during the morning to S.W., again at 2 p.m. to N.W. ; 3½ p.m., barometer, 29·55 ; wind N.W., and its pressure 20·25 lbs. At 4 p.m. the gale abated.

*Note*.—*August* was the hottest month and *February* the coldest. *January* and *February* were the most rainy months. Greatest height of the thermometer, *August*, 92·0°. Greatest fall of the thermometer, *December*, 44·0°. Mean temperature of the year, 64·3°. Total amount of rain in upper pluviometer, 51·55 inches.

ANNUAL REGISTER, compiled from the results of the Monthly Observations—*continued.*

## 1857.

| Months. | Barometer. | | Thermometer. | | | | Hygrometer. | | Rain. | | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9.30 A.M. | 3.30 P.M. | In Sun. | In Shade. | | | Dew Point. | Humidity. | On the Ground. | 25 Feet above. | |
| | | | Max. | Max. | Mean. | Min. | | | | | |
| January | 30·059 | 30·012 | Thermometer unserviceable. | 65·2 | 58·7 | 50·2 | 41·9 | ·680 | 1·715 | 1·746 | W. |
| February | 29·982 | 29·954 | | 66·1 | 54·5 | 42·2 | 46·0 | ·741 | 6·924 | 5·563 | E. |
| March | 30·061 | 30·025 | | 69·9 | 57·4 | 45·8 | 49·3 | ·704 | 2·425 | 3·438 | W. |
| April | 30·021 | 29·962 | 92·3 | 78·7 | 60·1 | 49·3 | 51·3 | ·695 | ·401 | ·460 | N.W. |
| May | 29·988 | 29·963 | 94·2 | 79·1 | 62·4 | 50·8 | 56·4 | ·698 | 2·710 | 2·543 | E. & W. |
| June | 30·056 | 30·034 | 128·3 | 84·7 | 69·4 | 57·8 | 59·9 | ·657 | ·680 | ·900 | E. |
| July | 30·087 | 30·057 | 113·2 | 93·4 | 75·4 | 62·2 | 65·5 | ·704 | No rain. | | E. |
| August | 29·981 | 29·956 | 107·3 | 92·2 | 75·6 | 61·6 | 65·7 | ·699 | ·438 | ·440 | E. |
| September | 30·076 | 30·040 | 100·8 | 87·3 | 72·6 | 53·7 | 63·2 | ·683 | ·695 | ·385 | E. |
| October | 30·012 | 29·979 | 101·5 | 81·4 | 71·3 | 53·9 | 58·6 | ·757 | 2·365 | 1·762 | E. |
| November | 29·987 | 29·946 | 94·1 | 69·8 | 62·1 | 44·6 | 55·6 | ·799 | 6·528 | 6·756 | E. |
| December | 30·307 | 30·263 | 83·9 | 68·4 | 59·1 | 48·3 | 47·9 | ·644 | 1·644 | 1·499 | E. |
| Sums | 360·617 | 360·191 | — | 936·2 | 778·6 | 620·4 | 666·3 | 8·481 | 26·495 | 24·492 | — |
| Results — Max. | 30·307 | 30·263 | 128·3 | 93·4 | 75·6 | 62·2 | 65·7 | ·799 | 6·924 | 5·563 | — |
| Results — Min. | 29·981 | 29·946 | — | 65·2 | 54·5 | 42·2 | 41·9 | ·654 | — | — | — |
| Results — Mean | 30·051 | 30·016 | — | 78·2 | 64·8 | 51·7 | 55·1 | ·707 | — | — | E. |

*January* 31*st.*—Ice at the Orange Bastion.

*July.*—7th and 8th, very hot and sultry, owing to large fires on the hills to the westward; the thermometer has never been so high in the shade (93·4°) since this observatory has been established.

*August.*—2nd, Heavy flashes of lightning, and thunder at a distance; 12th, heavy squalls during night; 20th, heavy rain, accompanied by hail and lightning.

*October* 28*th.*—Gale of wind during the night, lightning.

*November* 28*th.*—A thunderstorm came on at about 4.30 p.m., it abated at about 5 p.m., and came on again at about 8 p.m., when it lasted till 12, the wind blowing a gale.

*Note.*—*July* and *August* were the hottest months, and *February* the coldest. *February* and *November* were the most rainy months. Greatest height of the thermometer in the shade, *July*, 93·4°. Greatest fall of the thermometer in the shade, *February*, 42·2°. Greatest height of the thermometer in the sun, *June*, 128·0°. Mean temperature of the year, 64·8°. Total amount of rain in the upper pluviometer 24·492 inches.

## 1858.

| Months. | Barometer. | | Thermometer. | | | | Hygrometer. | | Rain. | | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9.30 A.M. | 3.30 P.M. | In Sun. | In Shade. | | | Dew Point. | Humidity. | On the Ground. | 25 Feet above. | |
| | | | Max. | Max. | Mean. | Min. | | | | | |
| January | 30·221 | 30·173 | 63·5 | 58·6 | 54·4 | 50·3 | 42·9 | ·662 | 9·044 | 9·492 | E. |
| February | 29·953 | 29·926 | 70·8 | 61·1 | 56·0 | 50·9 | 46·3 | ·733 | 9·440 | 9·395 | W. |
| March | 30·000 | 29·983 | 80·0 | 63·9 | 58·0 | 52·2 | 47·5 | ·715 | 6·330 | 7·190 | E. |
| April | 30·040 | 29·999 | 92·4 | 72·9 | 65·1 | 57·4 | 53·1 | ·658 | 0·038 | 0·000 | E. |
| May | 30·031 | 30·009 | 96·1 | 76·3 | 67·4 | 58·4 | 52·0 | ·575 | 0·491 | 0·190 | E. |
| June | 29·969 | 29·963 | 107·4 | 81·7 | 73·4 | 65·1 | 58·1 | ·567 | 0·060 | 0·070 | E. |
| July | 29·982 | 29·948 | 110·0 | 84·1 | 75·7 | 67·2 | 61·9 | ·599 | No rain. | | E. |
| August | 29·956 | 29·927 | 104·9 | 84·9 | 76·9 | 69·0 | 65·2 | ·656 | 0·508 | 0·416 | E. |
| September | 30·041 | 30·006 | 94·0 | 81·2 | 72·5 | 63·7 | 66·1 | ·705 | 4·040 | 2·005 | E. |
| October | 29·974 | 29·936 | 83·6 | 73·2 | 67·7 | 62·1 | 57·4 | ·719 | 6·800 | 10·010 | E. |
| November | 29·851 | 29·810 | 73·5 | 68·0 | 64·3 | 60·6 | 54·9 | ·739 | 24·330 | 29·223 | W. |
| December | 30·206 | 30·162 | 73·7 | 62·1 | 57·4 | 52·6 | 43·8 | ·614 | 2·615 | 2·630 | N.W. |
| Sums | 360·224 | 359·842 | 1,049·9 | 868·0 | 788·8 | 710·5 | 649·2 | 7·942 | 63·739 | 70·621 | — |
| Results — Max. | 30·221 | 30·173 | 110·0 | 84·9 | 76·9 | 69·0 | 66·1 | ·739 | 24·330 | 29·223 | E. |
| Results — Min. | 29·815 | 29·810 | 63·5 | 58·6 | 54·4 | 50·3 | 42·9 | ·567 | — | — | — |
| Results — Mean | 30·019 | 29·987 | 87·5 | 72·3 | 64·1 | 59·2 | 54·1 | ·662 | — | — | — |

*January* 29*th* and 30*th.*—Thunderstorm, heavy squalls and heavy rain.

*March* 6*th.*—Thunder and lightning and heavy gale; barometer, 29·089.

*May* 6*th.*—Thunderstorm; a large waterspout burst in N.W.

*July* 5*th.*—A heavy gale from the north.

*Note.*—*July* and *August* were the hottest months, and *January* the coldest. *January* and *November* were the most rainy months. Mean temperature for the year, 64·1°.

ANNUAL REGISTER, compiled from the results of the Monthly Observations—*continued.*

## 1859.

| Months. | Barometer. | | Thermometer. | | | | Hygrometer. | | Rain. | | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9.30 A.M. | 3.30 P.M. | In Sun. | In Shade. | | | Dew Point. | Humidity. | On the Ground. | 25 Feet above. | |
| | | | Max. | Max. | Mean. | Min. | | | | | |
| January | 30·282 | 29·928 | 69·8 | 60·0 | 55·1 | 50·2 | 42·7 | ·607 | 1·110 | 1·035 | E. |
| February | 30·168 | 30·118 | 71·5 | 60·4 | 56·1 | 51·9 | 42·5 | ·622 | 1·851 | 1·099 | E. |
| March | 30·158 | 30·103 | 77·1 | 65·3 | 59·1 | 52·9 | 46·0 | ·601 | No rain. | | E. |
| April | 30·023 | 29·998 | 79·1 | 71·5 | 64·0 | 56·5 | 54·5 | ·693 | 2·854 | 3·060 | W. |
| May | 29·927 | 29·892 | 80·2 | 75·8 | 66·5 | 57·2 | 56·5 | ·737 | 2·786 | 2·704 | W. |
| June | 30·030 | 29·999 | 81·7 | 78·8 | 61·1 | 69·9 | 61·3 | ·720 | 3·640 | 3·783 | W. |
| July | 30·055 | 30·013 | 90·1 | 83·5 | 76·4 | 69·0 | 68·2 | ·750 | No rain. | | S.E. |
| August | 29·962 | 29·923 | 93·1 | 86·1 | 77·7 | 69·3 | 68·3 | ·699 | 0·160 | 0·136 | W. |
| September | 30·029 | 29·990 | 91·6 | 82·0 | 74·1 | 66·2 | 65·7 | ·707 | 0·080 | 0·061 | E. |
| October | 29·939 | 29·955 | 82·2 | 72·4 | 66·1 | 59·9 | 59·2 | ·764 | 5·493 | 5·274 | W. |
| November | 30·103 | 30·056 | 75·1 | 65·5 | 61·0 | 56·5 | 54·0 | ·779 | 9·011 | 8·871 | W. |
| December | 30·076 | 30·004 | 69·7 | 61·1 | 57·6 | 52·1 | 49·0 | ·765 | 8·870 | 8·830 | E. |
| Sums | 360·752 | 359·979 | 961·2 | 863·4 | 774·8 | 711·6 | 667·9 | 8·444 | 35·855 | 34·853 | — |
| Results — Max. | 30·282 | 30·118 | 93·1 | 86·1 | 77·7 | 69·9 | 68·3 | ·779 | 9·011 | 8·871 | — |
| Results — Min. | 29·927 | 29·892 | 69·7 | 60·1 | 55·1 | 50·2 | 42·5 | ·601 | 0·080 | 0·060 | — |
| Results — Mean | 30·063 | 29·998 | 80·1 | 71·9 | 64·6 | 59·3 | 55·7 | ·704 | — | — | W. |

*Note.*—*August* was the hottest month, and *January* the coldest. *November* and *December* were the most rainy months. Mean temperature for the year, 64·6°.

## 1860.

| Months. | Barometer. | | Thermometer. | | | | Hygrometer. | | Rain. | | Prevailing Wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9.30 A.M. | 3.30 P.M. | In Sun. | In Shade. | | | Dew Point. | Humidity. | On the Ground. | 25 Feet above. | |
| | | | Max. | Max. | Mean. | Min. | | | | | |
| January | 30·165 | 30·109 | 70·1 | 61·4 | 56·6 | 51·8 | 50·1 | ·794 | 6·560 | 6·378 | W. |
| February | 30·062 | 30·024 | 66·8 | 56·5 | 50·7 | 44·9 | 41·3 | ·704 | 0·892 | 0·857 | N.W. |
| March | 30·092 | 30·027 | 69·5 | 62·6 | 57·7 | 52·8 | 51·7 | ·778 | 2·357 | 2·134 | E. |
| April | 29·939 | 29·912 | 73·6 | 66·8 | 60·5 | 54·1 | 55·5 | ·775 | 6·356 | 6·631 | N.W. |
| May | 29·978 | 29·958 | 82·9 | 77·1 | 68·5 | 59·9 | 62·5 | ·736 | No rain. | | E. |
| June | 29·981 | 29·957 | 88·6 | 81·6 | 71·9 | 62·1 | 63·9 | ·709 | 0·302 | 0·063 | W. |
| July | 29·953 | 29·927 | 92·0 | 84·2 | 76·0 | 67·8 | 65·9 | ·704 | 0·013 | 0·008 | E. |
| August | 29·957 | 29·921 | 92·1 | 83·3 | 76·1 | 68·9 | 67·1 | ·733 | 0·048 | 0·030 | E. |
| September | 30·000 | 29·960 | 87·0 | 78·0 | 69·9 | 61·7 | 59·9 | ·706 | 1·027 | 0·425 | N.W. |
| October | 30·112 | 30·070 | 82·5 | 72·9 | 67·6 | 62·3 | 60·1 | ·793 | 0·047 | 0·017 | E. |
| November | 29·961 | 29·919 | 79·3 | 69·4 | 63·6 | 57·8 | 58·7 | ·809 | 9·528 | 9·047 | N.W. |
| December | 29·999 | 29·963 | 72·4 | 64·3 | 59·4 | 54·4 | 53·0 | ·823 | 7·469 | 6·768 | W. |
| Sums | 360·199 | 359·747 | 956·8 | 858·1 | 778·5 | 698·5 | 689·7 | 9·064 | 34·599 | 32·358 | — |
| Results — Max. | 30·165 | 30·109 | 92·1 | 84·2 | 76·1 | 68·9 | 67·1 | ·823 | 9·528 | 9·047 | — |
| Results — Min. | 29·939 | 29·912 | 66·8 | 56·5 | 50·7 | 44·9 | 41·3 | ·704 | — | — | — |
| Results — Mean | 30·017 | 29·979 | 79·7 | 71·5 | 64·9 | 58·2 | 57·4 | ·755 | — | — | — |

*January.*—A strong gale from east from the 7th to the 10th.

*February.*—This month was unusually cold, the min. on the grass being 27·5°. Ice collected on various parts of the rock.

*September.*—Violent squalls on the night of the 12th, and morning of the 13th.

*October.*—Easterly winds very prevalent this month.

*December.*—The first few days of this month a remarkable calm prevailed, followed by a gale of wind on the 10th, from which day until the end of the year westerly winds accompanied by south-westerly gales were prevalent.

*Note.*—The hottest month in the shade was *July*, greatest heat on the 17th, 92·2° ; the coldest month in the shade was *February*, least heat on the 15th, 32·6°. Mean temperature for the year, 64·9°. Rain fell on 92 days ; greatest quantity collected in 24 hours, 5·245 in. ; *November* and *December* were the most rainy months.

MEANS of OBSERVATIONS taken between February 1852 and September 1861, both Months inclusive.

| Months. | Barometer Means at 93.0 A.M. and 3.30 P.M. | Mean Temperature. | Mean Rain. | | Prevailing Winds. | Remarks. |
|---|---|---|---|---|---|---|
| | | | On the Ground. | 25 Feet above. | | |
| | ins. | ° | ins. | ins. | | |
| January - | 30·056 | 55·5 | 7·070 | 6·279 | E. and N.W. | |
| February - | 30·007 | 55·1 | 6·167 | 6·099 | N.W. | |
| March - | 30·029 | 58·1 | 3·752 | 4·226 | E. and N.W. | |
| April - | 29·997 | 61·5 | 2·653 | 2·513 | N.W. | |
| May - | 29·958 | 65·5 | 2·419 | 2·227 | E. and W.S.W | |
| June - | 30·019 | 70·1 | 1·745 | 1·761 | E. | |
| July - | 29·988 | 75·0 | 0·003 | 0·001 | E. | |
| August - | 29·965 | 76·5 | 0·511 | 0·477 | E. | |
| September - | 30·017 | 72·3 | 1·444 | 1·047 | E. and N.W. | |
| October - | 30·022 | 67·4 | 3·595 | 3·662 | E. and N.W. | |
| November - | 29·958 | 60·9 | 10·320 | 10·424 | N.W. | |
| December - | 30·079 | 57·0 | 5·879 | 6·039 | N.W. | 23 inches of rain fell in Dec. 1861. When this is included in the means, the average quantity of rain for December will be about 8 inches. |

ABSTRACT showing the ANNUAL AMOUNT of RAIN collected at GIBRALTAR between the Years 1790 and 1860 ; also the TOTAL AMOUNT and MEAN during those Years.

| Years. | Amount. | Years. | Amount. | Years. | Amount. | Years. | Amount. | Years. | Amount. | Years. | Amount. | 25 Feet above Ground. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1790–1 | 29·090 | 1802–3 | 42·640 | 1814 | 27·050 | 1826 | 28·190 | 1838 | 50·830 | 1850 | 32·270 | —— |
| 1791–2 | 44·050 | 1803–4 | 50·910 | 1815 | 36·700 | 1827 | 25·990 | 1839 | 30·220 | 1851 | 22·120 | —— |
| 1792–3 | 19·080 | 1804–5 | 30·610 | 1816 | 25·240 | 1828 | 21·500 | 1840 | 37·350 | 1852 | 28·750 | —— |
| 1793–4 | 22·360 | 1805–6 | 39·450 | 1817 | 26·690 | 1829 | 61·150 | 1841 | 21·100 | 1853 | 46·730 | 45·400 |
| 1794–5 | 21·560 | 1806–7 | 29·690 | 1818 | 30·940 | 1830 | 26·690 | 1842 | 22·200 | 1854 | 38·320 | 33·010 |
| 1795–6 | 25·640 | 1807–8 | 33·010 | 1819 | 23·580 | 1831 | 42·900 | 1843 | 23·880 | 1855 | 75·840 | 69·350 |
| 1796–7 | 64·600 | 1808–9 | 31·220 | 1820 | 37·320 | 1832 | 18·940 | 1844 | 44·300 | 1856 | 42·540 | 51·550 |
| 1797–8 | 30·500 | 1809–0 | 37·360 | 1821 | 30·090 | 1833 | 26·730 | 1845 | 35·980 | 1857 | 26·495 | 24·492 |
| 1798–9 | 31·190 | 1810–1 | 27·684 | 1822 | 18·010 | 1834 | 42·250 | 1846 | 21·460 | 1858 | 64·144 | 70·621 |
| 1799–0 | 42·210 | 1811–2 | 40·370 | 1823 | 25·490 | 1835 | 32·060 | 1847 | 25·320 | 1859 | 35·855 | 34·853 |
| 1800–1 | 15·120 | 1812 | 47·020 | 1824 | 17·040 | 1836 | 13·660 | 1848 | 27·560 | 1860 | 34·599 | 32·358 |
| 1801–2 | 29·490 | 1813 | 31·630 | 1825 | 29·390 | 1837 | 33·790 | 1849 | 28·370 | | | |

Total Amount, 2,329·153 inches. Mean, 32·809 inches.

BENJ. S. STEHELIN, Colonel C. R.E.

No. 2.

RETURN of MORTALITY in the NORTH DISTRICT of GIBRALTAR during the Year 1860, showing the AGES and CAUSES of DEATH.

| Diseases. | Under 1 Year. | | From 1 to 5 Years. | | From 5 to 10 Years. | | From 10 to 15 Years. | | From 15 to 20 Years. | | From 20 to 30 Years. | | From 30 to 40 Years. | | From 40 to 50 Years. | | From 50 to 60 Years. | | From 60 to 70 Years. | | From 70 to 80 Years. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. |
| Ascites | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 |
| Asthma | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | 2 | 1 | 3 | 2 | – | 1 | 7 | 4 |
| Anemia | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – |
| Apoplexy | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 4 | 2 | 9 | 8 |
| Abscess | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | – |
| Accidental | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – |
| Bronchitis | – | – | 1 | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – | – | 1 | – | – | – | 3 | 1 |
| Brain fever | 2 | 1 | 3 | 8 | 1 | 1 | – | 1 | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | 6 | 13 |
| Consumption | 1 | – | 3 | 2 | – | – | – | – | – | 1 | 6 | 14 | 9 | 9 | 7 | 7 | 1 | 2 | 2 | 2 | – | 2 | 29 | 39 |
| Convulsions | 9 | 6 | 7 | 9 | 1 | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 18 | 16 |
| Cancer | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 2 | – | 2 | – | – | 1 | 1 | – | 5 | 2 |
| Croup | 2 | 1 | 3 | 2 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 5 | 4 |
| Chronic disease of bowels | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | 1 | 1 | 1 |
| Congestion of brain | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | 1 | – | – | 2 | 1 |
| Child-birth | – | – | – | – | – | – | – | – | – | – | – | 2 | – | 1 | – | 2 | – | – | – | – | – | – | – | 5 |
| Catarrh | 3 | 3 | 2 | 7 | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – | – | 2 | 1 | 1 | – | 8 | 13 |
| Cystitis | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – |
| Chronic anæmia | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 |
| Cerebritis | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Cholera | – | – | 2 | 1 | – | – | – | – | 3 | 1 | 5 | 7 | 3 | 1 | 3 | 2 | 2 | 5 | 1 | 2 | – | – | 20 | 18 |
| Diarrhœa | 1 | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | 1 | – | 3 | – |
| Dyspepsia | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – |
| Dysentery | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Dropsy | – | – | – | – | 2 | – | 1 | 1 | – | 1 | – | – | 1 | – | – | – | 5 | – | 1 | 3 | – | 1 | – | 6 | 10 |
| Erysipelas | – | 1 | – | – | – | – | – | – | – | – | 1 | – | – | 1 | – | – | – | – | 1 | – | – | – | 2 | 2 |
| Effusion of brain | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Epilepsy | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Fracture | – | – | 1 | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | 1 | – | – | – | – | – | 4 | – |
| Fistula | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 |
| Fever | 2 | 1 | – | 1 | – | – | 1 | – | – | – | – | – | 1 | 1 | 1 | – | – | – | – | – | – | – | 4 | 3 |
| Gastritis | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – |
| Gangrene | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | 1 | – | – | – | – | – | – | 1 | 1 |
| Gastralgia | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – |
| Hooping cough | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 |
| Hæmatemesis | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 |

Return of Mortality in the North District of Gibraltar during the year 1860—*continued.*

| Diseases. | Under 1 Year. | | From 1 to 5 Years. | | From 5 to 10 Years. | | From 10 to 15 Years. | | From 15 to 20 Years. | | From 20 to 30 Years. | | From 30 to 40 Years. | | From 40 to 50 Years. | | From 50 to 60 Years. | | From 60 to 70 Years. | | From 70 to 80 Years. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. |
| Hæmoptysis | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Hernia | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – |
| Heart disease | – | – | – | – | – | – | 1 | – | – | – | – | 1 | – | 1 | 1 | – | – | 2 | – | – | – | 2 | 2 | 6 |
| Inflammation of lungs | 1 | 2 | – | – | – | – | – | – | – | – | 1 | 1 | – | 1 | – | – | – | – | – | – | – | – | 2 | 4 |
| In infancy from weakness | 8 | 10 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 8 | 10 |
| Inflammation of bowels | 1 | 1 | 1 | 2 | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | 1 | – | – | 2 | 6 |
| Leprosy | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | – |
| Lock jaw | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 2 | – |
| Liver complaint | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – | – | – | – | – | 1 | 1 | 2 |
| Larynx, disease of | – | – | – | 1 | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | 2 | 1 |
| Mumps | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Mortification | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | 1 | – | 1 | 1 | – | – | 2 | 2 |
| Marasmus | 2 | 3 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | 3 |
| Meningitis | – | – | – | 1 | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | 1 |
| Measles | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 |
| Mania | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – |
| Nervous affection | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 |
| Old age | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 23 | 25 | 23 | 25 |
| Peritonitis | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Pneumonia | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – | 1 | 2 | – | – | 2 | 3 |
| Paralysis | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 2 | 3 | 4 | 1 | 8 | 4 |
| Parotitis | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Quinsey | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – |
| Rheumatism | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 2 | – |
| Scarlet fever | – | – | 2 | 1 | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 3 | 1 |
| Syphilis | 1 | 2 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 2 |
| Small pox | 1 | 1 | 7 | 4 | 5 | 2 | – | – | – | 1 | 3 | 1 | – | – | 2 | – | – | – | – | – | – | – | 18 | 9 |
| Spasms | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – |
| Suddenly | – | 1 | – | – | – | – | 1 | – | – | – | – | 1 | 1 | – | 1 | 1 | – | – | – | – | – | – | 3 | 3 |
| Teething | 7 | 8 | 8 | 4 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 15 | 12 |
| Typhus | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – |
| Ulcers | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Water in brain | – | 1 | 3 | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 3 | 2 |
| | 44 | 43 | 46 | 46 | 10 | 9 | 4 | 1 | 4 | 5 | 19 | 28 | 23 | 28 | 27 | 23 | 13 | 10 | 28 | 17 | 39 | 35 | 257 | 245 |

Births in Gibraltar in the year 1860.

| | |
|---|---|
| Males | 309 |
| Females | 281 |
| Total | 590 |

RETURN of MORTALITY in the SOUTH DISTRICT of GIBRALTAR during the Year 1860, showing the AGES and CAUSES of DEATH.

| Diseases. | Under 1 Year. | | From 1 to 5 Years. | | From 5 to 10 Years. | | From 10 to 15 Years. | | From 15 to 20 Years. | | From 20 to 30 Years. | | From 30 to 40 Years. | | From 40 to 50 Years. | | From 50 to 60 Years. | | From 60 to 70 Years. | | From 70 to 80 Years. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. |
| Apoplexy | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 |
| Brain fever | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Consumption | – | – | – | – | – | – | 1 | – | – | – | 1 | 2 | – | – | – | – | – | – | – | – | – | – | 2 | 2 |
| Convulsions | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Cancer | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | – |
| Child-birth | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – | 2 |
| Cholera | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Diarrhœa | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Dysentery | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Dropsy | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – |
| Epilepsy | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – |
| Fever | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 |
| Heart disease | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 |
| Inflammation of lungs | 1 | – | 1 | – | – | 1 | – | – | – | – | – | – | – | – | 1 | – | – | 1 | 1 | – | – | – | 4 | 2 |
| In infancy from weakness | 1 | 2 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 2 |
| Inflammation of bowels | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – |
| Liver complaint | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 |
| Mumps | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – |
| Old age | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 4 | 3 | 4 | 3 |
| Small pox | – | – | – | 1 | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 |
| Spasms | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 |
| Suddenly | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – | – | – | – | – | 2 |
| Teething | – | 3 | – | 2 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 5 |
| | 3 | 5 | 4 | 4 | – | 1 | 1 | – | – | – | 3 | 5 | 3 | – | 1 | 3 | 1 | 2 | 1 | 1 | 5 | 3 | 22 | 24 |

Police Office, 26th September 1861.

FRED. MIDDLETON,
Acting Police Magistrate.

## No. 3.

ABSTRACT showing the SICKNESS and DEATHS among the INDIGENT POOR of GIBRALTAR for the Year ending 31st December 1860.

| Class. | Order. | Diseases. | Admitted. | Died. |
|---|---|---|---|---|
| I. | 1 | Variola | 62 | 1 |
| „ | „ | Varicella | 3 | — |
| „ | „ | Morbilli | 6 | — |
| „ | „ | Scarlatina | 10 | — |
| „ | „ | Tonsillitis | 22 | — |
| „ | „ | Parotitis | 11 | — |
| „ | „ | Cynanche Trachealis | 2 | — |
| „ | „ | Pertussis | 6 | — |
| „ | „ | Febris Typhoides | 4 | — |
| „ | „ | „ Typhus | 4 | — |
| „ | „ | „ Intermittens | 9 | — |
| „ | „ | „ Continua | 180 | 3 |
| „ | „ | Ophthalmia | 36 | — |
| „ | „ | Erysipelas | 25 | — |
| „ | „ | Metria | 119 | — |
| „ | „ | Anthrax | 3 | — |
| „ | „ | Furunculus | 8 | — |
| „ | „ | Dysentery | 15 | — |
| „ | „ | Diarrhœa | 99 | — |
| „ | „ | Cholera | 68 | 10 |
| „ | „ | Cholerina | 25 | — |
| „ | „ | Rheumatism | 65 | — |
| „ | 2 | Syphilis Prim. | 41 | — |
| „ | „ | Gonorrhœa | 13 | — |
| „ | „ | Strictura Urethræ | 1 | — |
| „ | 3 | Scorbutus | 5 | — |
| „ | „ | Ebriositas | 1 | 1 |
| „ | 4 | Porrigo | 3 | — |
| „ | „ | Scabies | 2 | — |
| „ | „ | Vermes | 7 | — |
| II. | 1 | Podagra | 1 | — |
| „ | „ | Anæmia | 3 | — |
| „ | „ | Anasarca | 18 | 2 |
| „ | „ | Carcinoma | 2 | 4 ? |
| „ | „ | Scirrhoma | 1 | — |
| „ | „ | Gangrena Senilis | 3 | 1 |
| „ | 2 | Scrofula | 3 | — |
| „ | „ | Phthisis | 39 | 11 |
| „ | „ | Hæmoptysis | 22 | 2 |
| III. | 1 | Meningitis | 6 | 2 |
| „ | „ | Encephalitis | 8 | — |
| „ | „ | Apoplexia | 14 | 6 |
| „ | „ | Paralysis | 10 | 2 |
| „ | „ | Hemiplegia | 3 | — |
| „ | „ | Chorea | 2 | — |
| „ | „ | Delirium Tremens | 11 | — |
| „ | „ | Mania | 5 | 1 |
| „ | „ | Monomania | 1 | — |
| „ | „ | Dementia | 4 | — |
| „ | „ | Epilepsia | 12 | — |
| „ | „ | Hysteria | 33 | — |
| „ | „ | Tetanus | 4 | 1 |
| „ | „ | Convulsio | 29 | 1 |
| „ | „ | Eclampsia | 1 | — |
| „ | „ | Cephalæa | 10 | — |
| „ | „ | Neuralgia | 19 | — |
| „ | „ | Otitis | 4 | — |
| „ | 2 | Carditis | 7 | — |
| „ | „ | Pericarditis | 1 | 1 |
| „ | „ | Aneurisma | 2 | — |
| „ | „ | Syncope | 4 | — |
| „ | 3 | Epistaxis | 2 | — |
| „ | „ | Laryngitis | 3 | 3 |
| „ | „ | Bronchitis | 129 | 2 |
| „ | „ | Pleuritis | 25 | — |
| „ | „ | Hydrothorax | 2 | — |
| „ | „ | Pneumonia | 51 | — |
| „ | „ | Asthma | 26 | 2 |
| „ | „ | Angina Pectoris | 1 | — |
| „ | 4 | Glossitis | 1 | — |
| „ | „ | Stomatitis | 3 | — |
| „ | „ | Gastritis | 34 | 2 |
| „ | „ | Enteritis | 16 | — |
| „ | „ | Peritonitis | 2 | 1 |
| „ | „ | Obstipatio | 1 | — |
| „ | „ | Hernia, Strang | 7 | — |
| „ | „ | „ Inguin. | 1 | — |
| „ | „ | Dyspepsia | 12 | — |
| „ | „ | Colica | 78 | — |
| „ | „ | Hæmatemesis | 2 | 2 |
| „ | „ | Hæmorrhois | 4 | — |
| „ | „ | Fistula in Ano | 2 | 2 |
| „ | „ | Hepatitis | 9 | — |
| „ | „ | Icterus | 1 | — |
| „ | „ | Ascites | 7 | 3 |
| „ | „ | Meteorismus | 1 | — |
| „ | 5 | Nephritis | 2 | — |

Abstract showing the Sickness and Deaths, &c.—*cont.*

| Class. | Order. | Diseases. | Admitted. | Died. |
|---|---|---|---|---|
| III. | 5 | Ischuria | 4 | — |
| „ | „ | Calculus Vesicæ | 1 | — |
| „ | „ | Hæmaturia | 1 | — |
| „ | „ | Cystitis | 5 | 1 |
| „ | „ | Fistula in Perinæo | 1 | — |
| „ | 6 | Orchitis not Gonorrhœal | 15 | |
| „ | „ | Hydrops Ovarii | 1 | — |
| „ | 7 | Arthritis | 10 | — |
| „ | „ | Exostosis | 1 | — |
| „ | 8 | Urticaria | 4 | — |
| „ | „ | Eczema | 8 | — |
| „ | „ | Rupia | 1 | — |
| „ | „ | Ecthyma | 1 | — |
| „ | „ | Acne | 1 | — |
| „ | „ | Phlegmon | 3 | — |
| „ | „ | Abscessus | 22 | 1 |
| „ | „ | Paronychia | 4 | — |
| „ | „ | Ulcus | 51 | — |
| IV. | 1 | Dentitio | 26 | 1 |
| „ | „ | Tabes Mesenterica | 1 | — |
| „ | 2 | Chlorosis | 1 | — |
| „ | „ | Partus (1), Abortus (7) | 8 | — |
| „ | „ | Paramenia | 2 | — |
| „ | „ | Menorrhagia | 6 | — |
| „ | „ | Metroperitonitis | 1 | — |
| „ | „ | Vaginitis | 1 | — |
| „ | „ | Hystralgia | 1 | — |
| „ | „ | Metritis | 11 | 2 |
| „ | „ | Prolapsus Uteri | 4 | — |
| „ | 3 | Senectus | 19 | 8 |
| „ | 4 | Asthenia | 6 | — |
| „ | „ | Atrophia | 1 | 1 |
| „ | „ | Plethora | 3 | — |
| V. | 1 | Ambustio | 4 | 1 |
| „ | „ | Luxatura | 4 | — |
| „ | „ | Subluxatio | 11 | — |
| „ | „ | Fractura | 16 | 4 |
| „ | „ | Contusio | 55 | — |
| „ | „ | Concussio Cerebri | 2 | — |
| „ | „ | Vulnus Sclop. | 2 | — |
| „ | „ | „ Incisum | 20 | — |
| „ | „ | Morsus Asini | 1 | — |
| | | Total | 1,889 | 85 |

JOHN PAYNTER,
Deputy Inspector-General of Hospitals.

Principal Medical Officer's Office, Gibraltar, 5th November 1861.

## No. 4.

EXTRACT from INSPECTIONAL REPORT, dated Gibraltar, 31st January 1861.

CISTERNS and AQUEDUCTS.

| Name and Situation. | Quantity of Water they will contain. |
|---|---|
| | Gallons. |
| Officers' Quarters, No. 1, Castle - (2) | 11,766 |
| Do. do. 2 & 3 do. (3) | 28,340 |
| Do. do. 26 do. - | 6,125 |
| Do. do. 28 do. - | 16,625 |
| Castle Barracks - - - | 46,125 |
| Officers' Quarters, Castle Road - (2) | 5,691 |
| Provost, Moorish Castle - - | 7,684 |
| Commanding Royal Engineer's Quarters - - - (3) | 14,201 |
| Officers' Quarters, Bell Lane - - | 24,360 |
| Commanding Officer of Artillery's Quarters - - - (2) | 6,371 |
| Barrackmaster's Store, Town Range - | 3,501 |
| Engineer Building, Prince Edward's Rampart - - - - | 17,900 |
| Town Range Tanks { North - - | 54,791 |
| Town Range Tanks { South - - | 63,336 |
| Stanley's Buildings - - - | 13,728 |
| Officers' Quarters { No. 26. - - | 6,125 |
| Officers' Quarters { „ 39. - | 10,771 |

Cisterns and Aqueducts—*continued.*

| Name and Situation. | Quantity of Water they will contain. |
|---|---|
| Commissariat Bakery | 39,511 |
| Transport Yard | 43,688 |
| Senior Commissariat Officer's Quarters | 11,709 |
| Quarters, Paradise Row | 3,790 |
| Royal Engineer's Barracks | 20,304 |
| Ditto ditto Surface | 22,000 |
| Officers' Quarters, No. 15 | 6,250 |
| Gunner's Barrack | 33,371 |
| Royal Artillery Mess House, Governor's Parade | 21,725 |
| Spanish Pavilion | 47,644 |
| Officers' Quarters, No. 33 | 21,900 |
| Assistant Commissary-General's Quarters | * |
| King's Yard | 46,125 |
| F. O. Quarters, Southport Street (Iron) | 5,000 |
| Chaplain's Quarters, No. 6 | 7,500 |
| Clerk of Works' Quarters, Southport Street | 12,155 |
| Grand Store Yard, Military Store | 273,600 |
| Storekeeper's Quarters, Bomb House Lane | 11,288 |
| Surgeon's Quarters, ditto | 3,365 |
| Principal Medical Officer's Quarters, ditto | 7,200 |
| Officers' Quarters, No. 17 | 3,259 |
| Officers' Mess House, near King's Bastion | 84,700 |
| Deputy Storekeeper's Quarters | 14,900 |
| City Mill Lane | 16,968 |
| Grand Casemates | 191,250 |
| Wellington Front, 5 compartments | 125,860 |
| Officers' Casemates, Waterport | 127,500 |
| Signal Station, Upper | 19,300 |
| Jumper's Bastion | 52,000 |
| New Mole Fort | 13,382 |
| South Barrack Tank | 134,613 |
| Ditto ditto | 208,188 |
| Naval Hospital, No. 1, North end | 50,000 |
| Ditto „ 2, South end | 56,000 |
| Ditto Asylum | 6,500 |
| F. O. Quarters, and No. 43, sheds adjoining | 50,000 |
| Ditto, No. 38, No. 1. | 6,015 |
| Ditto, „ 38, „ 2. | 7,700 |
| Between Officers' Quarters, No. 40 and 41 | 21,937 |
| Viney's Cottage | 5,906 |
| F. O. Quarters, Europa Pass | 7,928 |
| Military Prison, Windmill Hill | 61,150 |
| Officers' Barracks ditto | 103,950 |
| Soldiers' ditto ditto No. 1 | 33,541 |
| Ditto ditto „ 2 | 54,967 |
| Fuze House ditto | 139,538 |
| Europa Hospital | 39,343 |
| Defensible Barrack, Europa | 68,137 |
| Brewery ditto, ditto | 132,656 |
| Buena Vista Barrack | 70,000 |
| F. O. Quarters, Europa Pass | 3,500 |
| Europa New Huts | 40,000 |
| Infants' School | 4,612 |
| Officers' Quarters, No. 10 | 3,500 |
| Buena Vista, Officers' Quarters | 62,212 |
| Total | 3,061,177 |
| *Projected.* | |
| Buena Vista Huts | 40,000 |
| Ditto Gulley | 1,500,000 |
| Moorish Castle | 1,500,000 |
| Commissariat Stores | 25,000 |
| Total | 3,065,000 |

* A larger tank projected.

Royal Engineer Office, Gibraltar,
20th September 1861.

List of Wells in the Garrison of Gibraltar.

| Where situated. | Imperial Gallons in one foot of depth. |
|---|---|
| Jumper's Bastion, Constant Spring | — |
| Orange Bastion | 60 |
| Landport Ditch | 240 |
| Cornwall's Parade | 44 |
| Casemate Barrack | 44 |
| King Street, F. O. Quarters, No. 29 | — |
| Line Wall, F. O. Quarters, No. 17 | 99 |
| Casemate Pavilion | — |
| King's Bastion | 78 |
| Town Range — Barrack | 44 |
| Town Range — No. 1, Pavilion | — |
| F. O. Quarters, No. 10, near Cathedral | — |
| Scud Hill | 240 |
| Ragged Staff | 372 |
| South Port Ditch | 372 |
| Do. Noria | 2,820 |
| Jumpers | 492 |
| Upper Sandpit | 396 |
| Lower do. | 396 |
| South Barracks — Under Mess House | 44 |
| South Barracks — Mess House Garden | 44 |
| South Barracks — Rear of Barrack | 99 |
| South Barracks — Pavilion, No. 34 | 72 |
| Windmill Hill Fireproof Barracks | 240 |
| Naval Hospital — Inside | 66 |
| Naval Hospital — Outside | 176 |

List of Private Tanks in Gibraltar.

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| I. | 1 | — | — | 1 |
| „ | 2 | 1 | 1,130 | — |
| „ | „ | 2 | 1,130 | — |
| „ | 3 | — | — | 1 |
| „ | 4 | — | — | 1 |
| „ | 5 | 3 | 990 | 2 |
| „ | 6 | — | 2,052 | 1 |
| „ | 7 | — | — | 1 |
| „ | 8 | — | — | 1 |
| „ | 9 | — | — | 1 |
| „ | 10 | — | — | 1 |
| „ | 11 | — | — | 1 |
| „ | 12 | — | — | 1 |
| „ | 13 | 4 | 3,120 | 1 |
| „ | 14 | 5 | 2,520 | 1 |
| „ | 17 | 6 | 1,300 | 1 |
| „ | 18 | — | — | 1* |
| „ | 19 | — | — | 1 |
| | | | 12,242 | |
| II. | 1 | — | — | 1 |
| „ | 2 | 1 | 791 | 1 |
| „ | 4 | 2 | 1,060 | — |
| „ | 5 & 6 | 3 | 1,589 | — |
| „ | 7 | 4 | 1,176 | — |
| „ | 8 | 5 | 5,292 | 1 |
| „ | 9 | 6 | 2,400 | — |
| „ | 12 | 7 | 1,203 | — |
| „ | 18 | 8 | 1,600 | — |
| „ | „ | 9 | 720 | — |
| „ | 21 | 10 | 365 | — |
| „ | 22 | 11 | 891 | — |
| „ | 23 | 12 | 2,255 | — |
| „ | 26 | 13 | 1,083 | — |
| „ | „ | 14 | 1,083 | — |

* Closed up.

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| II. | 28 | 15 | 552 | — |
| „ | 30 | 16 | 1,540 | — |
| „ | 31 | 17 | 810 | — |
| „ | 33 | 18 | 2,400 | — |
| „ | 35 | 19 | 1,575 | — |
| „ | 36 | 20 | 2,640 | — |
| „ | 37 | 21 | 920 | — |
| „ | 38 | 22 | 972 | — |
| „ | 39 | 23 | 1,012 | — |
| „ | 43 | 24 | 983 | — |
| „ | 44 | 25 | 1,404 | — |
| „ | 45 | 26* | — | — |
| „ | 46 | 27 | 456 | — |
| „ | 47 | 28 | 578 | — |
| „ | 48 | 29 | 1,260 | — |
| „ | 49 | 30 | 1,417 | — |
| | | | 40,027 | |
| III. | 1 | — | — | 1 |
| „ | „ | — | — | 1 |
| „ | 2 | 1 | 1,582 | 1 |
| „ | 3 | 2 | 1,509 | 1 |
| „ | 4 | 3 | 1,155 | 1 |
| „ | 5 | 4 | 1,848 | 1 |
| „ | 6† | — | — | — |
| „ | 7 & 8 | — | — | 1 |
| „ | 8 | 5 | 2,400 | 1 |
| „ | 11 | 6 | 472 | — |
| „ | 12 | — | — | 1 |
| „ | 16 | 7 | 228 | — |
| „ | 17 & 18 | 8 | 1,433 | — |
| „ | 19 | 9 | 2,629 | — |
| „ | 20 | — | — | 1 |
| „ | 21 | 10 | 1,732 | — |
| „ | 22 | 11 | 1,155 | — |
| „ | 23 | 12 | 3,042 | — |
| „ | 24 | 13 | 3,211 | 1 |
| „ | 25 | 14 | 945 | 1 |
| „ | 26 | 15 | 1,080 | 1 |
| „ | 27 | — | — | 1 |
| „ | 30 | — | — | 1 |
| „ | 31 | 16 | 5,525 | — |
| „ | 32 | 17 | 2,052 | 1 |
| „ | 33 | 18 | 1,828 | — |
| „ | 34 | 19 | 2,180 | 1 |
| „ | 35 | 20 | 1,848 | 1 |
| „ | 36 | — | — | 1 |
| „ | 37 | 21 | 643 | 1 |
| „ | 43 | 22 | 1,050 | — |
| „ | 44 | 23 | 1,248 | — |
| „ | 47 | — | — | 1 |
| „ | 48 | 24 | 1,632 | — |
| „ | 52 | 25 | 8,700 | — |
| | | | 51,122 | |
| IV. | 1 | 1 | 1,596 | 1 |
| „ | 2 | 2 | 1,050 | — |
| „ | 3 | — | — | 1 |
| „ | 4 | — | — | 1 |
| „ | 7 | 3 | 1,656 | — |
| „ | 8 | 4 | 1,728 | 1 |
| „ | 9 | — | — | 1 |
| „ | 10 | 5 | 2,880 | 1 |
| „ | 11 | — | — | 1 |
| „ | 12 | 6 | 1,820 | 1 |
| „ | 13 | 7 | 1,048 | — |
| „ | 14 | 8 | 2,322 | 1 |
| „ | 15 | 9 | 1,424 | — |
| „ | 16 | 10 | 1,897 | 1 |

* Tank not finished.
† Well supplied from No. 5.

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| IV. | 17 | 11 | 1,620 | 1 |
| „ | 18 | 12 | 2,117 | 1 |
| „ | 19 | 13 | 2,916 | 1 |
| „ | 20 | 14 | 2,048 | 1 |
| „ | 21 | 15 | 1,995 | 1 |
| „ | 22 | 16 | 2,970 | 1 |
| „ | 23 | 17 | 2,394 | — |
| „ | 24 | 18 | 2,376 | 1 |
| „ | 26 | 19 | 3,367 | 1 |
| „ | 27 | — | — | 1 |
| „ | 28 | — | — | 1 |
| „ | 29 | — | — | 1 |
| | | | 39,124 | |
| V. | 3 | 1 | 688 | — |
| „ | 4 | 2 | 900 | — |
| „ | 5 | 3 | 40 | — |
| „ | 6 | 4 | 1,562 | — |
| „ | 8 | 5 | 1,440 | — |
| „ | 10 | 6 | 1,656 | — |
| „ | 17 | 7 | 1,795 | — |
| „ | 18 | 8 | 2,426 | — |
| „ | 22 | 9 | 1,998 | — |
| „ | 23 | 10 | 1,111 | — |
| „ | 24 | 11 | 580 | — |
| „ | 25 | 12 | 2,320 | — |
| „ | 26 | 13 | 1,522 | — |
| „ | 27 | 14 | 1,691 | — |
| „ | 28 | 15 | 455 | — |
| „ | 29 | 16 | 845 | — |
| „ | 29 | 17 | 18,360 | — |
| „ | 31 | 18 | 1,650 | — |
| „ | 32 | 19 | 531 | — |
| „ | 33 | 20 | 411 | — |
| „ | 36 | 21 | 1,586 | — |
| „ | 37 | 22 | 816 | — |
| „ | 38 | 23 | 1,441 | — |
| „ | 39 | 24 | 1,118 | — |
| „ | 40 | 25 | 1,728 | — |
| „ | 41 | 26 | 1,980 | — |
| „ | 42 | 27 | 1,326 | — |
| „ | 43 | 28 | 1,086 | — |
| „ | 35 | 29 | 5,040 | — |
| | | | 58,132 | |
| VI. | 1 | — | — | 1 |
| „ | 2 | — | — | 1 |
| „ | 3 | 1 | 1,316 | — |
| „ | 4 | 2 | 1,485 | — |
| „ | 5 | 3 | 1,232 | 1 |
| „ | 6 | 4 | 2,992 | — |
| „ | 7 | 5 | 4,241 | — |
| „ | 8 | 6 | 2,098 | — |
| „ | 9 | 7 | 675 | 1 |
| „ | 10 | 8 | 3,648 | 1 |
| „ | 11 | 9 | 1,564 | 1 |
| „ | 12 | 10 | 2,656 | 1 |
| „ | 13 | 11 | 2,256 | 1 |
| „ | 14 | — | — | 1 |
| „ | 15 | — | — | 1 |
| „ | 16 | — | — | 1 |
| „ | 17 | 12 | 576 | 1 |
| „ | 18 | 13 | 742 | — |
| „ | „ | 14 | 742 | — |
| „ | 19 | 15 | 6,158 | 1 |
| „ | 21 | — | — | 1 |
| „ | 22 | 16 | 945 | — |
| „ | 23 | — | — | 1 |
| „ | 24 | — | — | 1 |
| „ | „ | — | 3,080 | 1 |
| „ | 26 | 17 | 720 | — |
| „ | 27 | 18 | 2,520 | — |
| „ | 29 | — | — | 1 |

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| VI. | 30 | — | — | 1 |
| ,, | 32 | — | — | 1 |
| | | | 39,846 | |
| VII. | 1 | 1 | 2,088 | — |
| ,, | 2 | 2 | 855 | 1 |
| ,, | 3 | — | — | 1 |
| ,, | 4 | 3 | 2,574 | 1 |
| ,, | 5 | — | — | 1 |
| ,, | 6 | 4 | 2,000 | — |
| ,, | 7 | 5 | 2,815 | 1 |
| ,, | 8 | 6 | 1,606 | 1 |
| ,, | 9 | — | — | 1 |
| ,, | 10 | — | — | 1 |
| ,, | 11 | — | — | 1 |
| ,, | 12 | — | — | 1 |
| ,, | 14 | 7 | 2,300 | — |
| ,, | 16 | 8 | 2,200 | — |
| ,, | 17 | 9 | 3,500 | — |
| ,, | 18 | — | — | 1 |
| ,, | 19 | 10 | 1,368 | 1 |
| ,, | 20 | 11 | 2,156 | 1 |
| ,, | 21 | 12 | 900 | — |
| ,, | 22 | 13 | 720 | 1 |
| ,, | 23 | 14 | 2,160 | 1 |
| ,, | 24 | 15 | 1,960 | 1 |
| ,, | 25 | 16 | 767 | 1 |
| ,, | 26 | 17 | 1,536 | 1 |
| ,, | 27 | 18 | 1,400 | 1 |
| | | | 32,925 | |
| VIII. | 1 | — | — | 1 |
| ,, | 2 | — | — | 1 |
| ,, | 3 | 1 | 2,730 | — |
| ,, | 4 | 2 | 1,282 | 1 |
| ,, | 5 | 3 | 1,239 | 1 |
| ,, | 6 | 4 | 1,075 | — |
| ,, | 8 | 5 | 4,160 | 1 |
| ,, | 9 | 6 | 2,000 | — |
| ,, | 10 | 7 | 1,500 | 1 |
| ,, | 12 | 8 | 431 | 1 |
| ,, | 14 | — | — | 1 |
| ,, | 16 | 9 | 3,040 | — |
| ,, | 17 | 10 | 2,961 | 1 |
| ,, | 18 | — | — | 1 |
| ,, | 19 | 11 | 2,508 | — |
| ,, | 20 | 12 | 900 | — |
| | | | 23,806 | |
| IX. | 1 | 1 | 1,200 | 1 |
| ,, | 2 | 2 | 1,805 | 1 |
| ,, | 3 | — | — | 1 |
| ,, | 4 | — | — | 1 |
| ,, | 5 | — | — | 1 |
| ,, | 7 | — | — | 1 |
| ,, | 8 | — | — | 1 |
| ,, | 9 | 3 | 1,680 | 1 |
| ,, | 10 | — | — | 1 |
| ,, | 12 | 4 | 2,160 | 1 |
| ,, | 13 | 5 | 1,800 | — |
| ,, | 14 | 6 | 907 | 1 |
| ,, | 16 | 7 | 2,382 | — |
| | | | 10,934 | |
| X. | 1 | 1 | 1,260 | 1 |
| ,, | 3 | 2 | 2,430 | 1 |
| ,, | 4 | 3 | 2,268 | 1 |
| ,, | 5 | 4 | 2,544 | — |
| ,, | 6 | 5 | 4,650 | — |
| ,, | 7 | 6 | 1,152 | 1 |
| ,, | 8 | 7 | 2,256 | — |
| ,, | 9 | — | — | 1 |
| ,, | 10 | 8 | 1,221 | — |

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| X. | 11 | 9 | 1,885 | — |
| ,, | 14 | — | — | 1 |
| ,, | 15 | 10 | 2,683 | — |
| ,, | 16 | — | — | 1 |
| ,, | 17 | 11 | 2,961 | 1 |
| ,, | 18 | 12 | 2,144 | — |
| ,, | 19 | 13 | 2,400 | 1 |
| ,, | 20 | — | — | 1 |
| ,, | 21 | 14 | 1,953 | — |
| ,, | 22 | 15 | 2,403 | 1 |
| | | | 34,201 | |
| XI. | 1 | 1 | 9,720 | — |
| ,, | 2 | — | — | 1 |
| ,, | 4 | 2 | 2,145 | — |
| ,, | 5 | 3 | 1,102 | — |
| ,, | 6 | 4 | 1,102 | — |
| ,, | 7 | 5 | 1,475 | — |
| ,, | 8 | 6 | 2,646 | — |
| ,, | 9 | 7 | 2,656 | — |
| ,, | 10 | 8 | 1,365 | — |
| ,, | 11 | 9 | 1,365 | — |
| ,, | 16 | 10 | 1,827 | — |
| ,, | 17 | 11 | 594 | — |
| ,, | 19 | 12 | 720 | — |
| ,, | 23 | 13 | 600 | — |
| ,, | 24 | 14 | 1,033 | — |
| ,, | 26 | 15 | 847 | — |
| ,, | 27 | 16 | 1,526 | — |
| ,, | 29 | 17 | 1,064 | — |
| ,, | 31 | 18 | 560 | — |
| ,, | 32 | 19 | 2,016 | — |
| ,, | 33 | 20 | 1,874 | — |
| ,, | 35 | 21 | 1,068 | — |
| | | | 37,305 | |
| XII. | 1 | — | — | 1 |
| ,, | 2 | — | — | 1 |
| ,, | 4 | 1 | 2,550 | — |
| ,, | 5 | 2 | 1,050 | — |
| ,, | 6 | 3 | 2,916 | — |
| ,, | 8 | 4 | 1,683 | — |
| ,, | 9 | — | — | 1 |
| ,, | 11 | 5 | 1,188 | — |
| ,, | ,, | 6 | 2,112 | — |
| ,, | 12 | 7 | 2,142 | — |
| ,, | 13 | 8 | 3,036 | — |
| ,, | ,, | 9 | 2,137 | — |
| ,, | 14 | — | — | — |
| ,, | 15 | 11 | 3,403 | — |
| ,, | 18 | 12 | 2,186 | 1 |
| ,, | 19 | 13 | 1,887 | — |
| | | | 26,290 | |
| XIII. | 5 | 1 | 1,453 | — |
| ,, | ,, | 2 | 1,875 | 1 |
| ,, | 6 | 3 | 1,942 | 1 |
| ,, | 7 | — | — | 1 |
| ,, | 10 | — | — | 1 |
| ,, | 11 | — | — | 1 |
| ,, | 12 | — | — | 1 |
| ,, | 14 | — | — | 1 |
| ,, | 15 | 4 | 1,454 | 1 |
| ,, | 18 | 5 | 1,530 | 1 |
| ,, | 19 | 6 | 1,776 | — |
| ,, | ,, | — | — | 1 |
| ,, | 20 | 7 | 3,360 | 1 |
| ,, | 23 | 8 | 3,542 | — |
| ,, | 26 | 9 | 1,000 | — |
| ,, | 27 | 10 | 1,800 | — |
| ,, | 28 | 11 | 4,531 | — |
| ,, | 29 | — | — | 1 |
| ,, | 30 | 12 | 5,800 | — |
| ,, | 31 | 13 | 2,000 | — |

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| XIII. | 32 | 14 | 4,500 | 1 |
| „ | 33 | 15 | 2,880 | 1 |
| „ | 34 | 16 | 2,940 | — |
| „ | 35 | 17 | 3,900 | — |
| „ | 36 | — | — | 1 |
| „ | 38 | 18 | 1,782 | — |
| | | | 48,065 | |
| XIV. | 1 | 1 | 1,600 | — |
| „ | 2 | 2 | 840 | — |
| „ | 4 | 3 | 3,192 | 1 |
| „ | 18 | 4 | 2,695 | — |
| „ | 19 | 5 | 1,326 | — |
| „ | 20 | 6 | 1,728 | — |
| „ | 21 | 7 | 2,016 | — |
| „ | 23 | 8 | 624 | — |
| „ | 26 | 9 | 2,156 | — |
| „ | 27 | 12 | 7,200 | — |
| „ | 30 | 11 | 1,040 | — |
| „ | 31 | 12 | 4,387 | — |
| „ | „ | 13 | 4,387 | — |
| „ | „ | 14 | 4,387 | — |
| „ | 39 | 15 | 1,063 | — |
| „ | 40 | 16 | 11,616 | — |
| „ | 41 | 17 | 401 | — |
| | | | 50,658 | |
| XV. | 1 | 1 | 2,152 | 1 |
| „ | 2 | — | — | 1 |
| „ | 5 | 2 | 2,400 | — |
| „ | 6 | — | — | 1 |
| „ | 7 | — | — | 1 |
| „ | 8 | — | — | 1 |
| „ | 10 | — | — | 1 |
| „ | 11 | — | — | 1 |
| „ | 12 | 3 | 2,880 | — |
| „ | 13 | 4 | 2,004 | 1 |
| „ | 14 | 5 | 2,664 | 1 |
| „ | 15 | 6 | 1,960 | — |
| „ | 16 | — | — | 1 |
| „ | 17 | — | — | 1 |
| „ | 18 | 7 | 776 | 1 |
| „ | 20 | 8 | 1,045 | — |
| | | | 17,881 | |
| XVI. | 1 | — | — | 1 |
| „ | 2 | — | — | 1 |
| „ | 3 | 1 | 1,425 | 1 |
| „ | 4 | 2 | 1,950 | — |
| „ | 5 | — | — | 1 |
| „ | 6 | — | — | 1 |
| „ | 7 | — | — | 1 |
| „ | 8 | — | — | 1 |
| „ | 9 | — | 1,950 | 1 |
| „ | 11 | — | 1,950 | 1 |
| „ | 13 | 3 | 3,311 | 1 |
| „ | 14 | 4 | 720 | 1 |
| „ | 15 | 5 | 1,558 | 1 |
| „ | 16 | 6 | 676 | — |
| „ | 17 | 7 | 2,457 | — |
| „ | 18 | — | — | 1 |
| „ | 19 | 8 | 2,255 | 1 |
| „ | 20 | — | — | 1 |
| „ | 21 | 9 | 2,772 | 1 |
| „ | 23 | — | — | 1 |
| „ | 24 | — | — | 1 |
| „ | 25 | — | — | 1 |
| „ | 26 | 10 | 1,451 | 1 |
| „ | 27 | — | — | 1 |
| „ | 28 | 11 | 882 | — |
| „ | 29 | 12 | 1,859 | — |
| „ | „ | 13 | 2,062 | — |
| | | | 27,278 | |

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| XVII. | 1 | — | — | 1 |
| „ | 2 | 1 | 426 | 1 |
| „ | 3 | — | — | 1 |
| „ | 4 | — | — | 1 |
| „ | 6 | — | — | 1 |
| „ | 7 | 2 | 1,638 | — |
| „ | 8 | — | — | 1 |
| „ | 10 | 3 | 3,663 | — |
| „ | 11 | 4 | 1,320 | — |
| „ | 12 | 5 | 1,680 | — |
| „ | 14 | — | — | 1 |
| „ | 16 | — | — | 1 |
| „ | 17 | 6 | 2,880 | — |
| „ | 19 | 7 | 1,560 | 1 |
| „ | 22 | — | — | 1 |
| „ | 23 | 8 | 1,140 | 1 |
| „ | 25 | — | — | 1 |
| „ | 26 | 9 | 1,350 | 1 |
| „ | 28 | 10 | 2,622 | 1 |
| „ | „ | 11 | 2,415 | — |
| „ | Revenue Police Office — | | | 1 |
| | | | 20,694 | |
| XVIII. | 2 | 1 | 3,562 | — |
| „ | 3 | 2 | 2,503 | — |
| „ | 6 | 3 | 992 | — |
| „ | 7 | 4 | 1,421 | — |
| „ | 8 | 5 | 1,183 | — |
| „ | 9 | 6 | 1,650 | — |
| „ | 10 | 7 | 1,440 | — |
| „ | 11 | 8 | 504 | — |
| „ | 12 | 9 | 950 | — |
| „ | 14 | 10 | 3,062 | — |
| „ | 16 | 11 | 690 | — |
| „ | „ | 12 | 690 | — |
| „ | 17 | 13 | 3,240 | — |
| „ | 19 | 14 | 2,837 | — |
| „ | 22 | 15 | 2,700 | — |
| „ | 23 | 16 | 2,700 | — |
| „ | 24 | 17 | 1,035 | — |
| „ | 25 | 18 | 1,125 | 1 |
| „ | 26 | 19 | 3,099 | — |
| „ | 28 | 20 | 2,772 | — |
| „ | 29 | 21 | 3,162 | — |
| „ | 32 | 22 | 4,350 | — |
| „ | 33 | 23 | 1,600 | — |
| „ | „ | 24 | 1,936 | — |
| | | | 49,373 | |
| XIX. | 1 | 1 | 2,632 | — |
| „ | 2 | 2 | 810 | — |
| „ | 3 | 3 | 968 | — |
| „ | 4 | 4 | 2,112 | — |
| „ | „ | 5 | 612 | — |
| „ | 5 | 6 | 1,485 | — |
| „ | 7 | 7 | 3,030 | — |
| „ | 8 | 8 | 1,190 | — |
| „ | 9 | 9 | 1,980 | — |
| „ | 10 | 10 | 997 | — |
| „ | 11 | — | — | 1 |
| „ | 12 | 11 | 1,296 | — |
| „ | 13 | 12 | 1,020 | — |
| „ | 14 | 13 | 3,456 | — |
| Garden. | 15 | 14 | 2,457 | — |
| „ | „ | 15 | 1,529 | — |
| „ | „ | 16 | 1,361 | — |
| No. 23 Yard. | „ | 17 | 3,225 | — |
| No. 22 Yard. | „ | 18 | 1,100 | — |
| „ | „ | 19 | 2,511 | — |
| | | | 33,771 | |

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| XX. | 1 | — | — | 1 |
| XXI. | 1 | 1 | 1,710 | 1 |
| ,, | 2 | — | — | 1 |
| ,, | 3 | 2 | 2,520 | — |
| ,, | 4 | — | — | 1 |
| ,, | 5 | 3 | 720 | 1 |
| ,, | 6 | 4 | 981 | 1 |
| ,, | 8 | — | — | 1 |
| ,, | 12 | 5 | 3,542 | 1 |
| ,, | 13 | 6 | 1,870 | — |
| ,, | ,, | 7 | 3,135 | — |
| ,, | 14 | 8 | 2,145 | — |
| ,, | 15 | 9 | 1,215 | 1 |
| ,, | 16 | 10 | 4,620 | 1 |
| ,, | 17 | 11 | 1,254 | 1 |
| ,, | 18 | 12 | 875 | — |
| ,, | 19 | 13 | 390 | — |
| ,, | ,, | 14 | 2,160 | — |
| ,, | 20 | 15 | 1,086 | — |
| ,, | 21 | — | — | 1 |
| ,, | 22 | 16 | 1,980 | — |
| ,, | 23 | 17 | 3,564 | — |
| ,, | 24 | 18 | 467 | — |
| | | | 34,234 | |
| XXII. | 1 | 1 | 2,268 | 1 |
| ,, | 2 | 2 | 2,070 | 1 |
| ,, | 5 | — | — | 1 |
| ,, | 6 | 3 | 2,184 | — |
| ,, | 8 | — | — | 1 |
| ,, | 9 | 4 | 1,805 | 1 |
| ,, | ,, | — | — | 1 |
| ,, | 10 | 5 | 888 | 1 |
| ,, | 12 | — | — | 1 |
| ,, | 14 | 6 | 1,552 | — |
| ,, | 15 | — | — | 1 |
| ,, | 16 | 7 | 4,350 | 1 |
| | | | 15,117 | |
| XXIV. | 1 | 1 | 1,943 | — |
| ,, | ,, | 2 | 2,394 | — |
| ,, | 2 | 3 | 2,342 | — |
| ,, | ,, | 4 | 1,440 | — |
| ,, | 6 | 5 | 1,482 | — |
| ,, | 7 | 6 | 900 | — |
| ,, | 8 | 7 | 1,260 | — |
| ,, | 9 | 8 | 590 | — |
| ,, | 10 | 9 | 5,628 | — |
| ,, | 12 | 10 | 2,160 | — |
| ,, | 15 | 11 | 2,464 | — |
| ,, | 17 | 12 | 857 | — |
| ,, | 20 | 13 | 803 | — |
| ,, | 21 | 14 | 783 | — |
| ,, | 22 | 15 | 500 | — |
| ,, | 23 | 16 | 800 | — |
| ,, | 24 | 17 | 960 | — |
| ,, | 25 | 18 | 3,080 | — |
| ,, | 27 | 19 | 1,260 | — |
| ,, | 30 | 20 | 2,268 | — |
| ,, | 30 | 21 | 900 | — |
| ,, | 31 | 22 | 675 | — |
| ,, | ,, | 23 | 776 | — |
| ,, | 32 | 24 | 1,156 | — |
| ,, | 34 | 25 | 1,100 | — |
| ,, | 35 | 26 | 1,920 | — |
| ,, | 37 | 27 | 890 | — |
| ,, | 38 | 28 | 943 | — |
| ,, | 41 | 29 | 2,772 | — |
| ,, | 43 | 30 | 931 | — |
| ,, | 44 | 31 | 6,912 | — |
| ,, | 45 | 32 | 607 | — |
| ,, | — | 33 | 8,624 | — |
| | | | 62,155 | |

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| XXV. | 5 | 1 | 20,350 | — |
| ,, | ,, | 2 | 7,649 | — |
| ,, | 10 | 3 | 6,720 | — |
| ,, | ,, | 4 | 1,053 | — |
| ,, | 19 | 5 | 540 | — |
| ,, | 20 | 6 | 810 | — |
| ,, | 22 | 7 | 1,242 | — |
| ,, | 24 | 8 | 6,400 | — |
| ,, | 27 | 9 | 891 | — |
| ,, | 29 | 10 | 1,440 | — |
| ,, | 31 | 11 | 420 | — |
| ,, | 34 | 12 | 560 | — |
| ,, | 36 | 13 | 2,070 | — |
| ,, | 39 | 14 | 1,559 | — |
| ,, | 41 | 15 | 1,150 | — |
| ,, | 42 | 16 | 3,696 | — |
| ,, | 44 | 17 | 918 | — |
| ,, | 45 | 18 | 720 | — |
| ,, | 47 | 19 | 3,024 | — |
| ,, | ,, | 20 | 1,575 | — |
| ,, | 48 | 21 | 1,053 | — |
| ,, | 49 | 22 | 3,250 | — |
| ,, | 50 | 23 | 630 | — |
| ,, | 51 | 24 | 2,656 | — |
| ,, | 55 | 25 | 1,701 | — |
| ,, | 57 | 26 | 1,008 | — |
| ,, | 58 | 27 | 2,080 | — |
| | | | 13,953 | |
| XXVI. | 1 | 1 | 1,500 | — |
| ,, | 2 | 2 | 900 | — |
| ,, | 6 | 3 | 1,110 | — |
| ,, | 10 | 4 | 1,452 | — |
| ,, | 11 | 5 | 1,350 | — |
| ,, | 13 | 6 | 528 | — |
| ,, | 14 | 7 | 1,650 | — |
| ,, | 16 | 8 | 567 | — |
| ,, | ,, | 9 | 2,304 | — |
| ,, | 17 | 10 | 1,800 | — |
| ,, | 18 | 11 | 1,232 | — |
| ,, | 23 | 12 | 1,254 | — |
| ,, | 24 | 13 | 756 | — |
| ,, | ,, | 14 | 833 | — |
| ,, | 26 | 15 | 783 | — |
| ,, | 29 | 16 | 897 | — |
| ,, | 31 | 17 | 1,092 | — |
| ,, | | 18 | 4,042 | — |
| ,, | Civil | 19 | 3,289 | — |
| ,, | Hospital | 20 | 3,496 | — |
| ,, | | 21 | 1,417 | — |
| | | | 32,452 | |
| XXVII. | 1 | 1 | 1,380 | — |
| ,, | 3 | 2 | 842 | — |
| ,, | 5 | 3 | 1,300 | — |
| ,, | 6 | 4 | 870 | — |
| ,, | 7 | 5 | 1,450 | — |
| ,, | 10 | 6 | 816 | — |
| ,, | 12 | 7 | 828 | — |
| ,, | 13 | 8 | 803 | — |
| ,, | 15 | 9 | 1,943 | — |
| ,, | 16 | 10 | 882 | — |
| ,, | 18 | 11 | 1,039 | — |
| ,, | 29 | 12 | 7,639 | — |
| ,, | 35 | 13 | 25,300 | — |
| | | | 45,492 | |
| XXVIII. | 1 | 1 | 3,600 | — |
| ,, | ,, | 2 | 3,847 | — |
| ,, | ,, | 3 | 664 | — |
| ,, | ,, | 4 | 812 | — |
| ,, | ,, | 5 | 960 | — |
| ,, | 2 | 6 | 3,750 | — |
| ,, | ,, | 7 | 972 | — |

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| XXVIII. | 2 | 8 | 1,152 | — |
| „ | 3 | 9 | 2,970 | — |
| „ | „ | 10 | 2,880 | — |
| „ | „ | 11 | 3,360 | — |
| | | | 24,267 | |
| | SOUTH DISTRICT. | | | |
| I. | 1 | — | — | 1 |
| „ | 3 | 1 | 1,080 | — |
| „ | 5 | 2 | 1,090 | — |
| „ | 7 | 3 | 1,032 | — |
| „ | 8 | 4 | 2,346 | — |
| „ | 9 | — | — | 1 |
| „ | 10 | — | — | 1 |
| „ | 13 | 5 | 748 | — |
| „ | „ | 6 | 1,144 | — |
| „ | 14 | 7 | 1,386 | — |
| „ | 19 | 8 | 2,846 | — |
| „ | „ | 9 | 1,984 | — |
| „ | 20 | 10 | 1,147 | — |
| | | | 14,803 | |
| II. | 1 | 1 | 574 | — |
| „ | 2 | — | — | 3 |
| „ | 4 | 2 | 1,800 | — |
| „ | 5 | 3 | 994 | — |
| „ | 6 | 4 | 2,057 | — |
| „ | 7 | 5 | 2,420 | — |
| „ | 10 | — | — | 1 |
| „ | 11 | 6 | 1,872 | — |
| „ | 13 | — | — | 1 |
| „ | 17 | 7 | 2,200 | — |
| | | | 11,917 | |
| III. | 1 | 1 | 615 | — |
| „ | 2 | 2 | 1,960 | — |
| „ | 3 | 3 | 1,190 | — |
| „ | 4 | 4 | 1,360 | — |
| „ | 6 | — | — | 1 |
| „ | 7 | 5 | 1,485 | — |
| „ | 8 | 6 | 1,200 | — |
| „ | 9 | 7 | 945 | — |
| „ | 10 | 8 | 1,425 | — |
| „ | 11 | 9 | 907 | — |
| „ | 13 | 10 | 1,188 | — |
| „ | 14 | 11 | 1,560 | — |
| „ | 15 | 12 | 2,709 | — |
| „ | 16 | 13 | 1,848 | — |
| „ | 18 | 14 | 2,520 | — |
| „ | 21 | 15 | 178 | — |
| „ | „ | 16 | 546 | — |
| „ | 23 | — | — | 1 |
| „ | 25 | 17 | 1,000 | — |
| „ | „ | 18 | 7,980 | — |
| „ | 26 | 19 | 3,864 | — |
| „ | 30 | 20 | 816 | — |
| „ | 31 | 21 | 1,210 | — |
| „ | 32 | 22 | 1,176 | — |
| „ | 33 | 23 | 660 | — |
| „ | 34 | 24 | 2,970 | — |
| „ | 35 | 25 | 2,821 | — |
| „ | 36 | 26 | 1,202 | — |
| „ | 37 | 27 | 1,325 | — |
| „ | 41 | 28 | 981 | — |
| „ | 45 | 29 | 1,881 | — |
| „ | 46 | 30 | 792 | — |
| „ | 47 | 31 | 525 | — |
| | | | 50,819 | |
| IV. | 1 | 1 | 520 | — |
| „ | 2 | 2 | 2,016 | — |
| „ | 3 | 3 | 2,656 | — |

List of Private Tanks—*continued.*

| District. | No. of House. | No. of Tank. | Contents in Cubic Feet. | No. of Wells. |
|---|---|---|---|---|
| IV. | 4 | 4 | 669 | — |
| „ | 5 | 5 | 1,080 | — |
| „ | 6 | 6 | 4,025 | — |
| „ | 8 | 7 | 1,755 | — |
| „ | 9 | 8 | 2,057 | — |
| | | | 14,778 | |
| V. | 1 | — | — | 1 |
| „ | 4 | 1 | 1,845 | — |
| „ | 6 | 2 | 396 | — |
| „ | 8 | 3 | 3,744 | — |
| „ | 9 | — | — | 2 |
| „ | 10 | — | — | 1 |
| | | | 5,985 | |
| VI. | 2 | 1 | 1,200 | — |
| „ | 4 | 2 | 729 | — |
| „ | 8 | 3 | 2,733 | — |
| „ | 9 | — | — | 1 |
| „ | 10 | — | — | 1 |
| „ | 15 | — | — | 1 |
| „ | 17 | — | — | 1 |
| „ | 18 | 4 | 3,000 | — |
| „ | 19 | 5 | 1,620 | — |
| „ | 20 | 6 | 1,200 | — |
| „ | „ | 7 | 800 | — |
| | | | 11,282 | |
| VII. | 4 | — | — | 3 |
| „ | 5 | — | — | 1 |
| „ | 6 | 5 | 1,610 | — |
| „ | 7 | — | — | 1 |
| „ | 9 | 6 | 528 | — |
| „ | 10 | 7 | 1,782 | — |
| „ | 1 | — | — | 1 |
| „ | 2 | — | — | 1 |
| „ | 3 | 8 | 2,450 | — |
| | | | 6,370 | |
| VIII. | 1 | 1 | 900 | — |
| „ | 3 | 2 | 2,100 | — |
| „ | „ | 3 | 2,975 | — |
| | | | 5,975 | |
| IX. | 1 | — | 1,923 | — |
| „ | 2 | — | — | 1 |
| „ | 5 | — | 1,097 | — |
| „ | 6 | — | 997 | — |
| „ | 7 | — | 3,744 | — |
| | | | 7,761 | |
| X. | 1 | — | 735 | — |
| „ | „ | — | 630 | — |
| „ | 2 | — | 2,972 | — |
| | | | 4,337 | |
| XI. | 5 | — | 1,365 | — |
| „ | „ | — | 6,066 | — |
| „ | 6 | — | 2,200 | — |
| „ | 7 | — | 4,098 | — |
| „ | 10 | — | 1,680 | — |
| „ | 8 | — | 4,850 | 2 |
| „ | 9 | — | 3,315 | — |
| | | | 23,572 | |

13th Jan. 1862.

J. L. WATSON,
Lieut. 25th Regt., K.O.Bs.

SUMMARY.

TOTAL CUBIC FEET IN TANKS IN NORTH DISTRICTS.

| | | | | | |
|---|---|---|---|---|---|
| I. | 12,242 | XI. | 37,305 | XXI. | 34,234 |
| II. | 40,027 | XII. | 26,290 | XXII. | 15,117 |
| III. | 51,122 | XIII. | 48,065 | XXIII. | — |
| IV. | 39,124 | XIV. | 50,658 | XXIV. | 62,155 |
| V. | 58,132 | XV. | 17,881 | XXV. | 13,953 |
| VI. | 39,846 | XVI. | 27,278 | XXVI. | 32,452 |
| VII. | 32,925 | XVII. | 20,694 | XXVII. | 45,492 |
| VIII. | 23,806 | XVIII. | 49,373 | XXVIII. | 24,267 |
| IX. | 10,934 | XIX. | 33,771 | | |
| X. | 34,201 | XX. | — | | 881,344 |

TOTAL CUBIC FEET IN TANKS OF SOUTH DISTRICT.

| | | | |
|---|---|---|---|
| I. | 14,803 | VIII. | 5,975 |
| II. | 11,917 | IX. | 7,761 |
| III. | 50,819 | X. | 4,337 |
| IV. | 14,778 | XI. | 23,572 |
| V. | 5,985 | | |
| VI. | 11,282 | | 157,599 |
| VII. | 6,370 | | |

| | |
|---|---|
| Total of North Districts | 881,344 |
| „ South District | 157,599 |
| | 1,038,943 |

## No. 5.

Chemical Department, Royal Arsenal,
Woolwich, S.E., 21st April 1862.

MEMORANDUM for the Inspector-General of Fortifications, from the Chemist of the War Department, with reference to Four Samples of Water received from Gibraltar, for Analysis.

The samples of water were described as follows :—

No. 1. Water from Neutral Ground well.
No. 2. „ from aqueduct.
No. 3. „ from tank.
No. 4. „ from well in yard of the public baths.

The proportions (in grains in an imperial gallon) of the important solid constituents of these waters are given in the following tabular statement :—

| | I. | II. | III. | IV. |
|---|---|---|---|---|
| Sulphate of lime | 4·56 | 12·49 | 1·55 | 15·16 |
| Nitrate of lime | 6·22 | 16·01 | 0·83 | 49·63 |
| Carbonate of lime | 12·24 | 17·04 | 0·94 | — |
| Carbonate of magnesia | 5·67 | 15·27 | 36·33 | 10·98 |
| Nitrate of magnesia | — | — | — | 7·11 |
| Alkaline chlorides (chlorides of sodium and potassium). | 7·48 | 28·59 | 3·59 | 80·24 |
| Organic matter | 4·06 | 9·94 | 5·02 | 7·70 |
| Ammonia | Slight trace. | Slight trace. | Trace. | Slight trace. |

The results of analysis show that the waters differ considerably from each other in composition.

No. 1 (from the Neutral Ground well), though a hard water, is considerably softer than the other three, and is therefore the most suitable for cooking and detergent purposes.

For drinking purposes the water from the tank (No. 3) is the least objectionable, since, though the proportion of organic matter which it contains is somewhat high, neither ammonia nor nitrates are present in considerable proportions. No. 1, on the other hand, contains a considerable amount of nitrates ; in No. 2 (aqueduct water), the proportion of nitric acid is very large ; while, in No. 4 (water from the well at the public baths), quite one-third of the solid matter contained in the water consists of nitrates. The two last-named waters (Nos. 2 and 4) are quite unfit for any but the most ordinary purposes, on account of their very great hardness, and of the very large proportions of nitrates and organic matter which they contain.

The water in the well at the public baths must, there is little doubt, become mixed to a very large extent with drainage matter, possibly in consequence of the shallowness of the well and of defects in its construction.

The composition of the aqueduct water favours the conclusion that this also must, in some way, be subject to similar contamination to the above well water.

J. A. ABEL,
Chemist of the War Department.

## No. 6.

Garrison Quartermaster's Office,
SIR, Gibraltar, 20th June 1857.

IN forwarding, for the information of your Excellency a return of the state of the tanks and wells, with the amount of water available for the use of the troops ; also a return of the amount of water required daily and also annually, I beg to make a few observations on the past and present means of supplying this population, consisting of, say, 16,000 inhabitants, and a garrison averaging in war 7,000, and in peace 6,000 troops.

In the first place the inhabitants owe nothing to the British Government for the small supply of water they have had for 150 years, because the first and the only supply of water led into the town was by means of an aqueduct of stone, mortar, and earthenware pipes, carried a distance of nearly one mile, between the source and the centre of the town, and all under ground ; unfortunately this underground communication has been cut off in several places by the erection of new works, and not rebuilt.

The source of this water supply is the face of the rock on which the rain falls and percolates through a bed of red sand, and a portion of the rain finds its way through weepers into a small tank or reservoir, from whence it flows into the town. It is a beautiful piece of work, said to be the ingenuity of an Italian during the occupation by the Spaniards, and doubtless answered every purpose, and afforded a bountiful supply to a small garrison and a population of 300 or 400 people, and it would be still ample for such a garrison and population, but not by any means sufficient for a garrison and population such as Gibraltar now contains, say, 23,000 souls ; and it would appear that from our conquest in 1704 down to within the last 15 years, nothing was done to collect water or to increase the supply, nothing whatever. That it was not until within the last 20 years that a system was commenced of building tanks at various barracks and quarters for the purpose of storing water for the troops, but even this has been so limited as to be quite inadequate to the wants of the garrison throughout the whole year, so much so that now, nearly all the tanks are exhausted at the beginning of summer, and when we cannot expect rain for three months.

The quantity of rain which fell on the ground from the first rains of the season, viz., 2nd August 1856 until 28th May 1857, was 25 inches and 239 parts of an inch, the average for the last 64 years being 31 inches 22 parts, or 6 inches below the average ; and while the fall has been 6 inches under average, unfortunately the whole of the rain *nearly* fell in the early part of the season ; and even then few of the tanks filled, from the paucity of spouting and conduits, and so long as water remained in the tanks it had to be used, to save expense of delivery by the contractor, but this expense is only shifted from the winter to the summer ; and another reason for the present deficiency arises from the crowded state of the garrison since the termination of the Russian war.

The present capacity of the military tanks amounts to 1,971,844 gallons, while the daily consumption amounts at present to 18,759 gallons, or per annum 6,845,935 gallons of water; thus it will be seen that tankage is still required to store nearly 5,000,000 gallons, and even then a much more extended system of conduits and spouting for filling would be required, not only for present, but for future tanks.

It is obvious that, from the immense rush of water which falls into the sea by means of the drains, &c., after two or three hours' rain, all that is required is an extended system of tanks, which ought to be above the town, and along the same level from north to south, or extending from the vicinity of the Moorish Castle to Windmill Hill. Those tanks or reservoirs might be excavated in the rock, and lined with brick and mortar, or the excavated stone and mortar; and I have no doubt that an able architect with 10,000*l.* and 200 convicts would place Gibraltar beyond the reach of want of water for ever.

It may be said, and probably it is true, that the supply of good water on the isthmus is inexhaustible, but the isthmus is below the level of any part of Gibraltar, and even if the water could be raised to a higher level, it would have to be forced into town through pipes by steam and machinery. Any work of this description on the north front, however, is highly objectionable, and in a military point of view is impossible. The Isthmus was occupied three times during the last century by an enemy, and their intrenchments were within 500 yards of the escarp, and as this may happen again, any measure adopted to procure water from the isthmus must be temporary; and considering that the conveyance from thence is expensive and tedious, it should not be considered as a means of itself anything half so important as the supply of the garrison itself with water, since it is evident that the Spaniards at a time when they never dreamt of the capture of Gibraltar, and with their own peninsula behind them, thought it necessary to undertake a measure of supply from inside, and the reservoir and aqueduct is a proof of their forethought.

Under those circumstances I am humbly of opinion that the time has fully arrived for Her Majesty's Government to undertake an important, strong, and efficient measure in connexion with the certain supply, by means of extensive reservoirs to contain large resources of water within the limits of the fortress.

That, as your Excellency is aware, no house is now permitted, nor has been for some years permitted, to be erected, without a tank forming part of the outlay on the property, and thus there are very many tanks in the fortress belonging to the inhabitants of the better class, but the owners also complain of the dryness of the season, and the low state of their tanks. But it is the poor who will most suffer from the high price of water when conveyed from the isthmus by means of water casks and donkeys; and that the troops too, must, will, and do suffer when placed on a stinted allowance of 2½ gallons a man daily for cooking and drinking, delivered at their several barracks.

That, with regard to the civil population, if a bountiful supply was always at hand, and that water could be led into their houses in town, by means of reservoirs from above, there is no possible reason why a water tax should not be laid on the rental, similar to the scavenging and lighting rate, which is 3½ per cent. on all property, and which is really the only tax of any kind in Gibraltar. Last year the declared value of property liable for the said tax was valued at 60,765*l.*, and the rate or tax amounted to 2,025*l.*, thus a rate of 2 per cent. would raise 1,215*l.* per annum towards any extensive outlay by Her Majesty's Government for a certain supply in this most important possession.

I have, &c.

W. Hume,

His Excellency Garrison Quartermaster.

Lt.-Gen. Sir James Ferguson, K.C.B.,

Governor.

Garrison Quartermaster's Office, Gibraltar, 20th June 1857.

Return of the Quantity of Water to which the Military Departments and Troops are entitled daily in the Garrison of Gibraltar, showing the Number of Gallons at present procured on the Spot, from Tanks and Wells, and the Number of Gallons supplied by Contract.

| Department, Regiment, or Corps. | Gallons of Water entitled to daily. | No. of Gallons procured on the Spot. | No. of Gallons supplied by Contractor. |
|---|---|---|---|
| Personal Staff of his Excellency the Governor | 67 | 23 | 44 |
| Staff—1st Brigade | 46 | 2 | 44 |
| 2nd Ditto | 73 | 13 | 60 |
| Assistant Adjutant-General | 21 | — | 21 |
| „ Quartermaster-General | 21 | — | 21 |
| Town Major's | 27 | — | 27 |
| Garrison Quartermasters' | 23 | 8 | 15 |
| Medical | 82 | 25 | 57 |
| Barrack | 23 | 6 | 17 |
| Prisons and Cells | 292 | 292 | — |
| Royal Artillery | 3,000 | 1,263 | 1,737 |
| „ Engineers | 739 | 462 | 277 |
| 2nd Battalion 1st Royal Regiment | 2,396 | 837 | 1,559 |
| 30th | 2,356 | 621 | 1,735 |
| 31st | 2,329 | 664 | 1,665 |
| 47th | 2,323 | 2,015 | 308 |
| 55th | 2,048 | 1,607 | 441 |
| 92nd | 2,361 | 2,215 | 146 |
| Garrison Guards | — | — | 382 |
| Hospitals, extra | — | — | 150 |
| Total | 18,227 | 10,074 | 8,685 |

Present daily cost of supplying 8,685 gallons of water, at 4*s.* per 500 gallons, 3*l.* 9*s.* 3*d.*

(Signed) W. Hume,

Garrison Quartermaster.

Cost of Transport of Water for the Troops, &c., during 5 years, viz.:

| | £ | s. | d. |
|---|---|---|---|
| 1852–53 | 532 | 19 | 5 |
| 1853–54 | 582 | 8 | 2 |
| 1854–55 | 508 | 18 | 9 |
| 1855–56 | 302 | 0 | 1 |
| 1856–57 | 579 | 2 | 2 |
| | £2,505 | 8 | 7 |

Extract from Return furnished by the Sanitary Inspectors on the subject of Water Supply at Gibraltar, with an Approximate Consumption and Expense thereof to the Inhabitants.

| Distribution. | Per Annum, Gallons. |
|---|---|
| 179 houses having no water laid on—no wells, containing 2,775 souls, who consume more or less 1½ gallons of water daily, which is conveyed on donkeys from the fountain in the centre of the town when water is to be had there, otherwise from the north front; water, sweet; but hard and brackish | 1,519,130 |
| 133 houses have wells of bad and brackish water, containing 2,320 persons, who consume one gallon of water daily | 846,800 |
| 136 houses having cisterns, which are for the most part dry from 1st Aug. to 30th Sept. in each year, say 60, which houses contain 4,497 persons, who consume 1½ gallons on an average daily | 404,730 |
| 10 wine houses and taverns that have wells of brackish water, and consume about 40 gallons each daily | 146,200 |
| | 2,910,860 |
| | Say 3,000,000 |

*Recapitulation.*

3,000,000 gallons, at 5 gallons to a barrel, 600,000 barrel, at 1*d.* per barrel, 2,500*l.* sterling per annum.

(Signed) W. HUME,
Garrison Quartermaster.

Gibraltar, 20th June 1857.

No. 7.

RETURNS showing the NUMBER of HOUSES, POPULATION, AMOUNT of WATER CARRIED INTO THE TOWN, its COST, also the DEATHS for Ten Years.

Number of Houses in Gibraltar.

| | |
|---|---|
| North Districts - - - | 853 |
| South Districts - - - | 161 |
| Total - | 1,014 |

Fixed Population of Gibraltar.

| | | |
|---|---|---|
| North Districts | Males - | 6,358 |
| | Females - | 7,540 |
| South Districts | Males - | 781 |
| | Females - | 883 |
| Total - | | 15,562 |
| Total fixed Population - | | 15,562 |
| Floating Population - - | | 2,085 |
| Grand Total - | | 17,647 |

Average Quantity of Water brought into the Garrison by Hand in 1860,—2,243,580 gallons, for Town district.

Estimate of annual cost of water per house, 3*l.* 19*s.* 1*d.*

Deaths at Gibraltar during the last Ten Years, exclusive of Military and Convicts.

| Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|
| 1851 - | 465 | 1857 - | 573 |
| 1852 - | 378 | 1858 - | 431 |
| 1853 - | 453 | 1859 - | 444 |
| 1854 - | 491 | 1860 - | 548 |
| 1855 - | 488 | | |
| 1856 - | 146 | Total - | 4,729 |

Police Office, Gibraltar, 26th September 1861.

FRED. MIDDLETON,
Acting Police Magistrate.

No. 8.

MEMORANDA for the SANITARY COMMISSION.

MILITARY.

*Return of Water Allowance.*

| | | |
|---|---|---|
| Each commissioned officer - | 7 | gallons daily. |
| „ non-commissioned officer, rank and file - - | 2½ | „ „ |
| „ woman - - - | 2½ | „ „ |
| „ child - - - | 1 | „ „ |
| „ civil servant - - | 2 | „ „ |
| „ horse - - - | 6 | „ „ |
| „ officers' mess - - | 100 | „ „ |
| „ serjeants' mess - - | 14 | „ „ |
| „ school-room - - | 8 | „ „ |
| „ dispensary - - | 8 | „ „ |

The water conveyed to the troops in garrison, by contractor, is taken indiscriminately from the wells on the North Front, the Jumpers, and Ragged Staff; the expense of conveying water to the troops on the average for five years is 500*l.* per annum. (See Return, *supra.*)

CIVIL.

An assessed rate on the annual rental of houses stables, cellars, vaults, buildings, &c., &c., according to the yearly value thereof, of a sum not exceeding 3⅓ per centum for the purpose of paving, repairing, and cleaning, and also for lighting the streets, lanes, alleys, &c., and for making and repairing sewers and drains, &c.

The annual rental for 1861 is computed at $355,380, at 3⅓ per cent. is equal to $11,846, adding the annual contribution for barracks $1,152, making the annual assessment for the above purpose, for the present year $12,998.

W. HUME,
Garrison Quartermaster.

No. 9.

By his Excellency Lieutenant-General Sir W. J. Codrington, K.C.B., Governor and Commander-in-Chief of the city and garrison of Gibraltar, &c.

I do hereby nominate and appoint the garrison quartermaster, or person acting as such for the time being, James Bassadone, James Barboro, Francis Imossi, Judah Nahon, Julius Peire, Francis Balestrino, Michael J. Coll, Andrew Carara, Anthony Gudice, Richard Parody, and Richard Abrines, Esquires, to act during the present year 1861, as the Commissioners and surveyors of the highways, streets, lanes, alleys, passages, and other public places of this city and garrison; and I authorize and direct you, or any of you, to superintend and carry into effect the paving repairing, and cleaning the same, and the making and repairing the sewers and drains therein, and generally to direct the scavenging department, and also the lighting this city and garrison, and to do all matters and things necessary in furtherance of the above objects within this city, garrison, and territory of Gibraltar, and the limits and precincts thereof; for which purpose I do hereby authorize William Hume, Esquire, garrison quartermaster, to act as treasurer and to receive all sums of money collected by the collector appointed by me for that purpose upon the "paving and scavenger's rate," and upon the "rate for lighting" for this present year, and to give legal discharge to such collector for the same: and I do hereby further direct you, or any five of you, as such surveyors as above mentioned, to make usual quarterly returns to me of all sums received and delivered by you as such surveyors, and of the stock of the above establishment, and of all the funds in the hands of the treasurer, with all proper vouchers as usual, in order that when sanctioned and approved by me, the same may be regularly laid before the public, by insertion in the Gibraltar Chronicle.

Given at Gibraltar this 4th day of January 1861.

W. J. CODRINGTON,
Lieut.-Gen. and Governor.

By command.

S. FREELING, Colonial Secretary.

No. 10.

PAVING AND SCAVENGER'S RATE.

At the Court at Brighton, the 30th day of December 1815:

PRESENT,

His Royal Highness the Prince Regent in Council.

It is this day ordered by His Royal Highness the Prince Regent, in the name and on the behalf of His Majesty, and by and with the advice of His Majesty's Privy Council:—

*Paving and Scavenger's Rate to be levied.*

That from and after the 1st day of February next there shall be assessed and levied, within His Majesty's garrison and town of Gibraltar and the limits and precincts thereof, a rate for the purpose of paving, repairing, and cleansing the streets, lanes, alleys, passages, and other public places thereof, and of making and repairing the sewers and drains therein, which rate shall be called a paving and scavenger's rate.

*Persons to be assessed.—Amount.*

And it is hereby further ordered, that such rate shall from time to time, so often as there shall be occasion, be assessed on every person who shall inhabit, use, occupy, possess, or enjoy any house, shop, or warehouse, coach-house, stable, cellar, vault,

building, land, tenement, or other hereditament within His Majesty's garrison and town of Gibraltar, or the limits or precincts thereof, according to the yearly value thereof, not exceeding three per cent. of such yearly value.

*Assessment to be made by Commissioners.*

And it is hereby further ordered, that such assessment shall be made from time to time by Commissioners who shall be appointed by the Governor, or in his absence by the Lieutenant-Governor, or in his absence by the Commander of His Majesty's Forces of Gibraltar for the time being, and shall be signed by such Commissioners, or any three of them, who shall give public notice thereof as soon as conveniently may be, in the Gazette published at Gibraltar, and deposit the same in the custody of some clerk or officer to be named in such notice, in whose hands all persons assessed shall have permission, at reasonable times, to peruse the same, and take extracts therefrom at their own expense.

*Appeal to two Justices.—Determination of Justices to be final.*

And it is hereby further ordered, that it shall be lawful for any person assessed to appeal against such assessment to His Majesty's justices of the peace for the said garrison and town, which appeal may be heard by any two of them; provided that such appeal shall be lodged with one of such justices, within six days after public notice shall be given of the rate being made as aforesaid, and provided eight days notice of such appeal shall be given to the Commissioners signing the assessment, or to the clerk or officer with whom the same shall be deposited as aforesaid, and also to any other parties assessed who may be affected by such appeal; and that the justices before whom such appeal is heard, shall have power to relieve the appellant by amending or altering the rate, in respect of the matter which shall be the subject of such appeal, as to them shall seem just, and in default of such appeal the assessment shall be binding; and in case of appeal the determination of the justices on any such appeal shall be final and conclusive to all intents and purposes.

*Governor to appoint a Collector.—Collector to give Bond.*

And it is hereby further ordered, that the Governor or in his absence the Lieutenant-Governor, or in his absence the Commander of the Forces for the time being, shall from time to time, by writing under their respective hands and seals, nominate and appoint a collector or collectors of such rate, and shall have power to remove such collector or collectors from time to time, and to appoint another or others in the stead of him or them so removed respectively; and that every such collector shall give bond to His Majesty, His heirs and successors, in such penal sum and with so many sureties as to the Governor, Lieutenant-Governor, or Commander of the Forces shall seem fit, for the due collection of all rates to be made while he shall continue to fill the office of collector, and for duly accounting for and paying over all rates by him collected to such officer as by the Governor, Lieutenant-Governor, or Commander of the Forces shall be approved for that purpose, and that the money so collected shall be applied in the payment of the expenses already incurred or which may hereafter be incurred in the paving, repairing, and cleansing the streets, lanes, alleys, passages, and other places of the said garrison and town.

*Collector to receive Compensation.*

And it is hereby further ordered, that every such collector shall receive compensation for his time, trouble, and responsibility in collecting such rates, by an allowance to be made to him by the authority of the Governor, Lieutenant-Governor, or Commander-in-Chief for the time being; provided such allowance shall be sanctioned by one of His Majesty's Principal Secretaries of State.

*Process to compel Payment by Distress and Sale.* (*Vide Charter of Justice*, (*supra*, *p.* 14.)

And it is hereby further ordered, that in case any person assessed to such rate shall refuse or neglect to pay the sum assessed to him or her, after demand thereof made at his or her usual place of abode, or upon the premises assessed, the collector shall, by warrant under the hand and seal of the Governor, Lieutenant-Governor, or Commander of the forces for the time being, levy such rate, and all arrears thereof, and the reasonable expenses of such levy, on the goods and chattels of the person charged with such rate, in any part of the said garrison and town, or limits and precincts aforesaid; and if within five days after such distress taken, the sum assessed shall not be paid, together with the reasonable charges of taking and keeping the distress, the collector shall cause the same to be appraised and sold, either by public auction or private contract, or such part as shall be sufficient to pay the sum assessed, with all charges of taking, keeping, and selling the distress, and shall return to the owner of such goods and chattels the surplus thereof, if any shall be; and if any goods or chattels of such persons refusing or neglecting to pay such rates shall be taken in execution for the debt of any other person, or distrained for rent, before such rate shall be paid, the officer executing, or the party so distraining, shall first pay or satisfy, out of the proceeds of such goods and chattels, the amount of the said rate then due, and all arrears thereof.

*Fraudulent Removal of Goods to avoid Distress.*

And it is hereby further ordered, that in case any person so assessed shall fraudulently or clandestinely convey away his goods and chattels for the purpose of preventing the same from being distrained for such rate, it shall be lawful for the collector, being empowered by such warrant as aforesaid, within thirty days next after such conveying away of such goods and chattels, to seize the same, wherever the same shall be found, as a distress for the said rate, and to sell or otherwise to dispose of the same in such manner as if the same had not been conveyed away, provided that such goods and chattels shall not, before such seizure made, have been sold bonâ fide, and for a valuable consideration, to any person not privy to such fraudulent conveying away as aforesaid. And the Right Honourable the Lords Commissioners of His Majesty's Treasury, and the Right Honourable Earl Bathurst, one of His Majesty's Principal Secretaries of State, are to give the necessary directions herein accordingly.

CHETWYND.

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LIGHTING RATE.

At the Court at Brighton, the 1st of February 1819:

PRESENT,

His Royal Highness the Prince Regent in Council.

I. Whereas by an Order of His Royal Highness the Prince Regent, in the name and on behalf of His Majesty, and by and with the advice of His Majesty's Privy Council, made on the 30th day of December 1815, it was ordered, that from and after the first day of February next after the date of the said Order, there should be assessed and levied within His Majesty's garrison and town of Gibraltar, and the limits and precincts thereof, a rate for the purpose of paving, repairing, and cleansing the streets, lanes, alleys, passages, and other public places thereof, and of making and repairing the sewers and drains therein, which should be called a paving and scavenger's rate.

II. And it thereby further ordered that such rate should from time to time be assessed on every person who should inhabit, use, occupy, possess, or enjoy any house, shop, warehouse, coach-house, stable, cellar, vault, or building, land, tenement, or other hereditament within His Majesty's garrison and town

of Gibraltar, or the limits or precincts thereof, according to the yearly value thereof, not exceeding three per cent. of such yearly value.

III. And whereas certain Commissioners to be appointed by the Governor, or in his absence the Lieutenant-Governor, or in his absence by the Commander of His Majesty's Forces for the time being, were by the said Order authorized and empowered to make such assessment from time to time in manner therein specified, and certain provisions, authorities, and directions were therein specified for the purpose of collecting and levying the said assessment, and of appealing against the same.

IV. And whereas it is expedient and necessary that provision should also be made for lighting the said garrison and town of Gibraltar, and the limits and precincts thereof, and that provision should be made for the purpose of defraying one half of the expense by the inhabitants of the said garrison and town, and the limits and precincts thereof.

V. It is this day ordered by His Royal Highness the Prince Regent, in the name and on the behalf of His Majesty, and by and with the advice of His Majesty's Privy Council, that from and after the first day of April next, there shall be assessed and levied within His Majesty's garrison and town of Gibraltar, and the limits and precincts thereof, a rate for the purpose of lighting the streets, lanes, alleys, passages, and other public places thereof, which shall be called a rate for lighting the garrison and town of Gibraltar.

*Persons to be assessed.—Amount.*

VI. And it is hereby further ordered, that such rate shall from time to time, so often as there shall be occasion, be assessed on every person who shall inhabit, use, occupy, possess, or enjoy any house, shop, warehouse, coach-house, stable, cellar, vault, building, land, tenement, or other hereditament within His Majesty's garrison and town of Gibraltar, or the limits or precincts thereof, according to the yearly value thereof, not exceeding one-third of a pound sterling per cent. of such yearly value.

*Assessment to be made by the Commissioners under recited Order, and in the same manner.*

VII. And it is hereby further ordered, that such assessment shall be made from time to time by the Commissioners appointed or to be appointed from time to time under the authority and powers of the said recited Order of 30th December 1815, for the making of the assessment of the rate in such manner and form, and according to the same rules and regulations as are by the said recited Order of the 30th December 1815, ordered and directed with respect to the assessment of the said paving and scavenger's rate thereby imposed.

*Method of Appeal to be the same.*

VIII. And it is hereby further ordered, that it shall be lawful for any person or persons assessed to the rate hereby imposed to appeal against the same, in the same manner and form, and under the like rules and regulations and notices, and to the like tribunals and justices, and to receive relief therein under the like rules, regulations, and restrictions as are by the said recited Order ordered and directed with respect to appeals against the said paving and scavenger's rate, in the same manner as if the same rules, regulations, and restrictions were in this Order repeated, enumerated, and set forth.

*Method of Collection to be the same.*

IX. And it is hereby further ordered, that the rate hereby imposed for lighting the garrison and town of Gibraltar shall be collected and levied by the same persons, and under the like allowances, rules, regulations, directions, and restrictions as are ordered, directed, and specified in the said recited Order of the 30th December 1815, relative to the collecting and levying the said rate called the paving and scavenger's rate; and that all such allowances, rules, regulations, directions, and restrictions as are ordered, directed, and specified in the said recited Order with respect to the rate called the paving and scavenger's rate, shall be and the same are hereby applied and ordered to be applied to the collecting and levying the rate hereby imposed for lighting the garrison and town of Gibraltar, as if the same were herein repeated, enumerated, and set forth.

X. And the Right Honourable the Lords Commissioners of His Majesty's Treasury, and the Right Honourable Earl Bathurst, one of His Majesty's Principal Secretaries of State, are to give the necessary directions herein accordingly.

JAMES BULLER.

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By his Excellency Lieutenant-General Sir W. J. Codrington, K.C.B., &c., Governor and Commander-in-Chief of the city and garrison of Gibraltar, &c. &c.

By virtue of the power and authority vested in me, I do hereby nominate and appoint John Peacock, James Smith, Andrew Cormack, Joseph Shakery, William Glassford, Moses Camino, John Collingwood, Francis Francia, junior, Charles Thibaudier, Bartholomew Mascardi, Henry Foote, and Judah de Azar Serfaty, Esquires, to be Commissioners to make an assessment for a rate or rates for one year commencing on the 1st day of January 1861, for the purpose of paving, repairing, and cleaning, and also for lighting the streets, lanes, alleys, passages, and other public places of this city, garrison, and territory, and for making and repairing the sewers and drains therein, and paying all the expenses already incurred, or which may be hereafter incurred in this respect to be called "the paving and scavenger's rate," and a "rate for lighting," to be duly assessed and levied within the city, garrison, and territory of Gibraltar, and the limits and precincts thereof, on any person who shall inhabit, use, occupy, possess, or enjoy any house, stable, cellar, vault, building, lands, tenements, or other hereditaments within the same, according to the yearly value thereof, in pursuance of the Orders in Council in that behalf made and provided.

And I do hereby further desire you, or any three of you at the least, to sign such assessment or rates, and to deposit the same as soon as made, in the custody of the clerk of arraigns, and to give public notice forthwith in the Gibraltar Chronicle, that the same has been so made and deposited: And the persons assessed may have permission to peruse the same at all reasonable times, and to take extracts therefrom at their own expense.

Given at Gibraltar this 4th day of December 1860.

W. J. CODRINGTON,
Lt.-Gen. and Governor.

By command.

S. FREELING, Colonial Secretary.

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1861.

Assessed rates at 3⅓ per cent.

| | $ |
|---|---|
| Private properties | 28,393 |
| Barrack and engineer department | 266 |
| Commissariat department | 272 |
| Naval department | 82 |
| Revenue department | 502 |
| Cottage, Europa Advance | 100 |
| Monthly rental | $29,615 |
| Annual rental | $355,380 |
| $355,380, at 3⅓ per cent. | $11,846 |
| Adding annual contribution from the barrack department | 1,152 |
| Annual assessment for 1861 | $12,998 |

W. HUME,
Garrison Quartermaster.

## No. 11.

SICKNESS and MORTALITY among TROOPS at GIBRALTAR.

| Classes. | Orders. | — | 1859.—Strength 5,153. Admitted into Hospital. | Deaths. At Gibraltar. | Deaths. Of Invalids. | Total. Died. | Annual Ratio per 1,000 of Strength. Admitted. | Annual Ratio per 1,000 of Strength. Died. | 1837–46. Average Annual Strength, 3,313. Annual Ratio per 1,000 of Strength. Admitted. | 1837–46. Average Annual Strength, 3,313. Annual Ratio per 1,000 of Strength. Died. | Infantry at Home, 1859. Annual Ratio per 1,000. Admitted. | Infantry at Home, 1859. Annual Ratio per 1,000. Died. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I. | 1 | Miasmatic diseases | 1,472 | 20 | — | 20 | 285·6 | 3·88 | 356·4 | 3·47 | 168·1 | 1·12 |
| | 2 | Enthetic | 1,334 | — | — | — | 258·9 | — | 78·8 | — | 399·4 | — |
| | 3 | Dietic | — | 2 | — | 2 | — | ·39 | ·2 | — | 1·2 | — |
| | 4 | Parasitic | 52 | — | — | — | 10·1 | — | 1·7 | — | 27·2 | — |
| II. | 1 | Diathetic | 38 | — | — | — | 7·4 | — | 3·1 | ·09 | 2· | ·10 |
| | 2 | Tubercular | 31 | 2 | 3 | 5 | 6· | ·97 | 11· | 4·89 | 12·7 | 2·55 |
| | | Diseases of the— | | | | | | | | | | |
| III. | 1 | Nervous system | 81 | 1 | — | 1 | 15·7 | ·19 | 18·6 | 1·15 | 11·3 | ·51 |
| | 2 | Circulatory „ | 54 | 2 | — | 2 | 10·5 | ·39 | 4·5 | ·63 | 7· | ·66 |
| | 3 | Respiratory „ | 350 | 1 | — | 1 | 67·9 | ·19 | 125·3 | 1·03 | 94·3 | 1·12 |
| | 4 | Digestive „ | 150 | 2 | — | 2 | 29·1 | ·39 | 73·9 | ·72 | 28·4 | ·41 |
| | 5 | Urinary „ | 10 | — | — | — | 1·9 | — | 1·4 | — | 1·4 | ·15 |
| | 6 | Reproductive „ | 9 | — | — | — | 1·7 | — | 1·3 | — | 1· | — |
| | 7 | Locomotive „ | 17 | — | — | — | 3·3 | — | ·7 | — | 2·3 | ·05 |
| | 8 | Integumentary „ | 837 | — | — | — | 162·5 | — | 152·6 | ·21 | 128·1 | — |
| IV. | 4 | Diseases of Nutrition | 3 | — | — | — | ·6 | — | ·2 | ·09 | 2·5 | — |
| V. | 1 | Accidents | 355 | 1 | — | 1 | 68·9 | ·19 | 100·9 | ·82 | 60·6 | ·77 |
| | 3 | Homicide | — | — | — | — | — | — | — | ·03 | — | — |
| | 4 | Suicide | — | 5 | — | 5 | — | ·98 | — | ·30 | ·1 | ·15 |
| | 5 | Execution | — | 1 | — | 1 | — | ·19 | — | ·06 | — | — |
| | 6 | Corporal Punishment | 23 | — | — | — | 4·5 | — | 5·2 | — | 5·4 | — |
| | | Diseases not stated | 73 | — | — | — | 14·2 | — | 2·9 | ·09 | 11· | — |
| | | Total | 4,889 | 37 | 3 | 40 | 948·8 | 7·76 | 938·7 | 13·58 | 964·0 | 7·59 |

## No. 12.

TABLE showing the Number of Men in each Barrack in the Garrison for every 50 cubic feet of space in Barrack Rooms from 250 to above 600 cubic feet, and for every 10 superficial feet from 20 to above 60 superficial feet per Man.

| Barracks. | Cubic Feet. 250 to 300. | 350 to 400. | 400 to 450. | 450 to 500. | 500 to 550. | 550 to 600. | Above 600. | Superficial Feet. 20 to 30. | 30 to 40. | 40 to 50. | 50 to 60. | Above 60. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. |
| Grand Casemates | — | 602 | 564 | — | — | — | — | — | 1,166 | — | — | — |
| Orange Bastion | — | — | 160 | — | — | — | — | — | 160 | — | — | — |
| Prince Albert's Front | — | 90 | — | — | — | — | 24 | — | 90 | 12 | — | 12 |
| King's Bastion | — | — | 256 | — | — | — | — | — | 256 | — | — | — |
| Wellington Front | — | 24 | — | 436 | 38 | 18 | 17 | 44 | 489 | — | — | — |
| Moorish Castle | — | 40 | 40 | — | — | — | — | — | 80 | — | — | — |
| Gunner's Barracks | — | — | — | 24 | — | — | — | — | — | 24 | — | — |
| Town Range | — | 100 | 220 | — | — | — | — | — | 320 | — | — | — |
| Hargrave's Barracks | — | 71 | 20 | — | — | 40 | — | — | 111 | 20 | — | — |
| Jumper's Bastion | — | — | — | — | 192 | — | — | — | 192 | — | — | — |
| Rosia Casemates | — | — | 72 | — | — | — | — | — | 72 | — | — | — |
| South Barracks | — | — | 696 | — | — | — | — | — | 696 | — | — | — |
| Rosia Barracks | — | — | — | — | 549 | — | — | — | 549 | — | — | — |
| Buena Vista | — | — | 220 | 132 | 64 | — | — | — | 416 | — | — | — |
| Windmill Hill | 402 | — | — | — | — | — | — | 402 | — | — | — | — |
| Fuze House | — | — | — | — | — | — | 22 | — | — | — | 22 | — |
| Defensible Barracks | — | — | — | — | — | 100 | — | — | 100 | — | — | — |
| Europa new Huts | — | — | — | — | — | 384 | — | — | — | 384 | — | — |
| Brewery Barracks | — | — | 40 | 40 | — | 30 | — | — | 110 | — | — | — |
| Total | 402 | 927 | 2,288 | 632 | 843 | 572 | 63 | 446 | 4,807 | 440 | 22 | 12 |

## No. 13.

RETURN of BARRACKS at GIBRALTAR, showing the COOKING ACCOMMODATION of each.

Royal Engineer Office, Gibraltar, 24th September 1860.

| Barracks. | Boilers, Elliptical, Regulation Pattern, 25 galls., with Steam Pipe. | Boilers, Elliptical, Regulation Pattern, 25 galls., without Steam Pipe. | Boilers, Elliptical, Regulation Pattern, 15 galls., with Steam Pipe. | Boilers, Elliptical, Regulation Pattern, 15 galls., without Steam Pipe. | Boilers, Rectangular, without Steam Pipe. | | Boilers, Rectangular, without Steam Pipe. | | Common Cast Iron Pots, 16 Gals. | Crimean Stoves, &c. | Ovens. | | Benham's Cooking Apparatus for 1,000 Men. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 26" by 19" and 19" | 24" by 16" and 16" | 19" by 13" | 28" by 16" | | | Brick. | Iron. | |
| Hargraves Barracks - | 6 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| Town Range Barracks - | 8 | — | — | — | — | — | — | — | — | — | — | — | — |
| Moorish Castle - - | 4 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| Grand Casemates - - | 24 | — | — | — | — | 1 | 1 | 3 | — | — | 2 | — | — |
| Orange Bastion - - | 5 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| P. Albert's Front Barrks. | 4 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| King's Bastion - - | 8 | — | — | — | — | — | — | — | — | — | 2 | — | — |
| Wellington Front - - | 12 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| North Front Camp - | — | 6 | — | — | 4 | — | — | — | — | 25 | — | — | — |
| Catalan Bay - - | 1 | — | — | — | 1 | — | — | — | — | — | — | — | — |
| Gunners Barracks - | — | — | — | — | — | 2 | 1 | — | — | — | 1 | — | — |
| Jumper's Bastion - - | 6 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| South Barracks - - | 19 | — | 8 | — | — | — | — | — | — | — | 2 | 1 | — |
| Rosia Barracks - - | 14 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| Rosia Casemates - - | 2 | — | — | — | — | — | — | — | — | — | — | — | — |
| Buena Vista Barracks - | — | 10 | — | — | — | — | — | — | — | — | — | — | — |
| Windmill Hill Barracks - | — | 11 | — | 1 | — | — | — | — | — | — | 1 | — | — |
| Windmill Hill Huts - | — | 10 | — | — | — | — | — | — | — | — | — | — | — |
| Europa New Hutment - | 6 | — | — | — | — | — | — | — | — | — | — | — | 1 |
| Old Hutment - - | — | 2 | — | 3 | — | — | — | — | — | — | — | — | — |
| Defensible Barrack - | 4 | — | — | — | — | — | — | — | — | — | 1 | — | — |
| Brewery Barrack - - | — | 3 | — | — | — | — | — | — | — | — | 1 | — | — |
| Fuze House - - | — | 1 | — | — | — | — | — | — | 1 | — | — | — | — |

N. FERGUSON, Clerk of Works.

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## No. 14.

RETURN of ordinary BARRACK ROOMS, WOODEN HUTS, and other BUILDINGS occupied by MARRIED SOLDIERS on the 1st October 1861, together with the NUMBER of INMATES, MEN, WOMEN, and CHILDREN, in each ROOM; also the NUMBER of suitable MARRIED QUARTERS required for the GARRISON.

A.—BARRACK ROOMS.

| Corps. | Name of Barrack. | No. of Room. | Dimensions with cubic Contents. | Occupied by | | | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | | No. of Men. | No. of Women. | No. of Children. | |
| | | | cubic feet. | | | | |
| Royal Artillery - | Jumper's Bastion - - | 5 | 14,592 | 6 | 6 | 4 | |
| | | 6 | 14,592 | 8 | 8 | 9 | |
| Royal Engineers - | None. | | | | | | |
| 2d Batt. 6th Regt. | None. | | | | | | |
| 2d Batt. 7th Regt. | None. | | | | | | |
| 2d Batt. 8th Regt. | Wellington Front - - | soldier 1 | 10,863 | 6 | 6 | 12 | |
| | ,, - - | ,, 2 | 10,891 | 6 | 6 | 14 | |
| | ,, - - | ,, 4 | 11,342 | 5 | 5 | 6 | |
| | ,, - - | ,, 5 | 13,244 | 6 | 6 | 13 | |
| | ,, - - | N.C.O. 2 | 2,959 | 1 | 1 | 2 | |
| | ,, - - | ,, 3 | 2,959 | 1 | 1 | — | |
| | ,, - - | ,, 4 | 2,959 | 1 | 1 | — | |
| | ,, - - | store 1 | 2,959 | 1 | 1 | 3 | |
| | ,, - - | ,, 2 | 2,959 | 1 | 1 | 2 | |
| | King's Bastion - - | soldier 14 | 5,922 | 6 | 6 | 8 | |
| | ,, - - | ,, 15 | 5,922 | 6 | 6 | 11 | |
| | ,, - - | ,, 16 | 5,874 | 6 | 6 | 6 | |
| | Town Range - - | ,, 5 | 9,546 | 6 | 6 | 6 | |
| 1st Batt. 25th Regt. | Rosia Casemates - - | 2 | 4,997 | 1 | 1 | 3 | |
| | ,, - - | 3 | 4,997 | 3 | 3 | 5 | |
| | ,, - - | 4 | 4,958 | 1 | 1 | 3 | |
| | ,, - - | 5 | 4,958 | 2 | 2 | 2 | |
| 100th Regiment - | Grand Casemates - - | 11 | 20,107 | 10 | 10 | 10 | |
| | | 12 | 19,549 | 9 | 10 | 18 | |

## B.—Number of Wooden Huts or other Buildings (distinguishing the Nature).

| Corps. | Whether Hut or Building. | No. of Hut or Building. | Dimensions with cubic Contents. | Occupied by: No. of Men. | Occupied by: No. of Women. | Occupied by: No. of Children. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | cubic feet. | | | | |
| Royal Artillery - | Casemates, Prince Albert's Front (intended for store rooms) - - - | 9 | 6,114 | 3 | 3 | 1 | |
| | | 10 | 6,114 | 2 | 2 | 1 | |
| | | 11 | 6,114 | 2 | 2 | 3 | |
| | | 12 | 6,114 | 2 | 2 | 2 | |
| | Retrenchment (officers' quarters) King's Bastion - | 2 | 3,776 | 1 | 1 | 4 | Master Gunner. |
| | Officers' quarters, South Jumpers - - | 1 | 5,239 | 1 | 1 | – | Master Gunner. |
| | | 2 | 5,185 | 1 | 1 | 2 | |
| | Officers' kitchens, South Jumpers - - - | 1 | 5,555 | 1 | 1 | – | Assistant Gunnery Instructors. |
| | | 3 | 5,555 | 1 | 1 | – | |
| Europa Flats. | Officers' guard room - | – | 4,051 | 1 | 1 | 2 | Master Gunner. |
| | Huts - - - | 3 | 2,071 each room. | 1 | 1 | – | |
| | | 4 | 2,071 | 1 | – | – | Pay Serjeant. |
| | | 5 | 2,071 | 1 | 1 | 1 | |
| | | 6 | 2,071 | 1 | 1 | 1 | |
| | School room, Brewery barracks - - | – | 2,599 | 1 | 1 | 1 | Pay Serjeant. |
| | Boxes, Brewery barracks | 3 | 20,623 | 7 | 7 | 11 | This room is partitioned into 10 boxes, occasionally occupied by 10 families. |
| | Huts, Windmill Hill - | 3 | 4,295 | 2 | 2 | 3 | |
| | | 5 | 4,343 | 1 | 1 | 4 | Master Gunner. |
| | Cottages, Moorish Castle. | 1 | 3,564 | 1 | 1 | 1 | |
| | | 2 | 1,589 | 1 | 1 | – | |
| | | 3 | 1,662 | 1 | 1 | 5 | |
| | | 4 | 1,845 | 1 | 1 | 1 | |
| | | 5 | 1,717 | 1 | 1 | 1 | |
| | The private property of Royal Artillery, kept in repair by a small rental levied upon the occupants. | 6 | 1,453 | 1 | – | – | Pay Serjeant. |
| | | 7 | 1,364 | 1 | 1 | 1 | |
| | | 8 | 1,834 | 1 | 1 | – | |
| | | 9 | — | 1 | 1 | 2 | |
| | | 10 | 4,513 | 1 | 1 | 3 | Master Gunner. |
| | | 11 | 2,072 | 1 | 1 | 1 | |
| | | 12 | 2,072 | 1 | 1 | – | |
| | Cottages, Moorish Castle. | 13 | 2,072 | 1 | 1 | 1 | |
| | | 14 | 2,072 | 1 | 1 | 2 | |
| | | 15 | 1,922 | 1 | 1 | 1 | |
| | | 16 | 1,224 | 1 | 1 | 1 | |
| | | 17 | 1,293 | 1 | 1 | 3 | |
| | | 18 | 2,581 | 1 | 1 | – | |
| | | 19 | 2,049 | 1 | 1 | 3 | |
| | | 20 | 1,607 | 1 | 1 | 2 | |
| | | 22 | 2,194 | 1 | 1 | 3 | |
| | | 23 | 2,114 | 1 | 1 | 2 | |
| | | 24 | 1,618 | 1 | 1 | – | |
| | | 25 | 1,739 | 1 | 1 | – | |
| | | 26 | 1,637 | 1 | 1 | 3 | |
| | | 27 | 1,641 | 1 | 1 | – | |
| | | 28 | 2,118 | 1 | 1 | 6 | |
| | | 29 | 2,118 | 1 | 1 | 1 | |
| | The private property of Royal Artillery, kept in repair by a small rental levied upon the occupants. | 30 | 2,118 | 1 | 1 | 2 | |
| | | 31 | 1,911 | 1 | 1 | 1 | |
| | | 32 | 5,041 | 1 | 1 | 4 | Master Gunner. |
| | | 33 | 2,394 | 1 | 1 | 4 | |
| | | 34 | 3,442 | 1 | 1 | 5 | |
| | | 35 | 1,255 | 1 | 1 | 3 | |
| | | 36 | 1,255 | 1 | 1 | – | |
| | | 37 | 1,222 | 1 | 1 | 1 | |
| | | 38 | 1,105 | 1 | 1 | – | |
| | | 39 | 1,642 | 1 | 1 | – | |
| | | 40 | 1,642 | 1 | 1 | 1 | |
| | | 41 | 2,248 | 1 | 1 | 4 | |
| | | 42 | 1,952 | 1 | 1 | – | |
| | | 43 | 1,935 | 1 | 1 | – | |
| | | 44 | 2,688 | 1 | – | – | Battery Serjeant Major. |
| | | 45 | 4,587 | 1 | 1 | 4 | Master Gunner. |
| | | 46 | | | | | |
| | | 47 | 2,074 | 1 | – | 2 | Master Tailor. |
| Royal Engineers - | Hargraves* - - - | — | 1,960 | 1 | 1 | – | Attached to barrack, four married quarters, not ordinary barrack rooms. |
| | | — | 2,700 | 1 | 1 | – | |
| | | — | 3,655 | 1 | 1 | 1 | |
| | | — | 5,390 | 1 | 2† | 1 | |
| | Town Range* - - | — | 1,655 | 1 | 1 | 1 | Three married quarters, not ordinary barrack rooms. |
| | | — | 2,039 | 1 | 1 | 1 | |
| | | — | 2,194 | 1 | 1 | 1 | |
| | Building, partly wooden, South Sheds - - | — | 3,807 | 1 | 1 | 1 | |
| | Crutchetts Ramp, stone building - - | — | 3,480 | 1 | 1 | 3 | Six separate buildings, each occupied by a different family. |
| | | — | 3,480 | 1 | 1 | 4 | |
| | | — | 2,118 | 1 | 1 | 2 | |
| | | — | 2,278 | 1 | 1 | 2 | |
| | | — | 2,278 | 1 | 1 | 1 | |
| | | — | 2,278 | 1 | 1 | 1 | |

* The buildings marked thus * are Government buildings, the remainder have been built at different periods by the men of the corps.
† 1 servant.

## B.—Number of Wooden Huts or other Buildings, &c.—*continued.*

| Corps. | Whether Hut or Building. | No. of Hut or Building. | Dimensions with cubic Contents. | Occupied by: No. of Men. | Occupied by: No. of Women. | Occupied by: No. of Children. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | cubic feet. | | | | |
| Royal Engineers | Engineer building* | — | 4,847 | 1 | – | – | Schoolmaster. |
| | Prince Edward's Ramp, stone building | — | 2,673 | 1 | 1 | 2 | Three separate buildings, each occupied by different families. |
| | | | | 1 | 1 | 1 | |
| | | | | 1 | 1 | – | |
| | Prince Edward's Road, stone building | — | 1,763 | 1 | 1 | 1 | |
| | George's Street, stone building* | — | 3,366 | 1 | 1 | 4 | |
| | | — | 3,366 | – | 1 | 1 | Schoolmistress. |
| | Sandpit, stone building | — | 2,035 | 1 | 1 | – | |
| | North Front, stone buildings | — | 1,926 | 1 | 1 | 1 | Ten separate buildings, each occupied by a different family. |
| | | — | 1,152 | 1 | 1 | 1 | |
| | | — | 1,152 | 1 | 1 | 1 | |
| | | — | 2,010 | 1 | 1 | 1 | |
| | | — | 862 | 1 | 1 | – | |
| | | — | 2,100 | 1 | 1 | 1 | |
| | | — | 1,548 | 1 | 1 | 1 | |
| | | — | 3,108 | 1 | 1 | – | |
| | | — | 1,440 | 1 | 1 | 1 | |
| | | — | 743 | 1 | 1 | 1 | |
| | Commanding Royal Engineer's lodge, stone building | — | 1,693 | 1 | 1 | – | |
| | Buena Vista, stone buildings | — | 3,842 | 1 | 1 | – | Four separate buildings, each occupied by different families. |
| | | — | 2,968 | 1 | 1 | – | |
| | | — | 12,057 | 1 | 1 | 1 | |
| | | — | 1,872 | 1 | 1 | 1 | |
| 2nd Batt. 6th Regiment. | Building | — | 3,775 | 1 | 1 | 2 | Serjeant Major. |
| | ,, | — | 2,575 | 1 | 1 | 4 | Quartermaster Serjeant. |
| | ,, | — | 2,935 | 1 | 1 | – | Armourer Serjeant. |
| | Hut | 1 | 4,295 | 3 | 3 | 2 | |
| | ,, | 2 | 4,295 | 3 | 3 | 7 | |
| | ,, | 4 | 4,295 | 3 | 3 | 5 | |
| | ,, | 6 | 4,295 | 3 | 3 | 2 | |
| | ,, | 7 | 4,295 | 2 | 2 | 4 | |
| | ,, | 8 | 4,295 | 2 | 2 | 4 | |
| | ,, | 9 | 4,295 | 2 | 2 | 3 | |
| | ,, | 10 | 4,295 | 3 | 3 | 2 | |
| | ,, | 11 | 4,295 | 2 | 2 | 2 | |
| | ,, | 12 | 4,295 | 2 | 2 | 3 | |
| | ,, | 14 | 4,295 | 2 | 2 | 5 | |
| | ,, | 15 | 4,295 | 3 | 3 | 5 | |
| | At Catelan Bay | – | – | 1 | 1 | 1 | On detachment. |
| | 2 schoolmasters | – | – | 2 | 2 | 5 | Provided with special quarters. |
| 2nd Batt. 7th Regiment. | Huts: Hut, Europa | 1 | No. 1, 1,708 | No. 2, 1,708 | 2 | 2 | 3 |
| | ,, | 2 | 1,944 | 1,687 | 1 | 1 | – |
| | ,, | 3 | 1,708 | 1,708 | 1 | 1 | – |
| | ,, | 4 | 1,708 | 1,708 | 2 | 2 | – |
| | ,, | 5 | 1,708 | 1,708 | 2 | 2 | 1 |
| | ,, | 6 | 1,708 | 1,708 | 2 | 2 | 2 |
| | ,, | 7 | 1,708 | 1,708 | 1 | 1 | 2 |
| | ,, | 8 | 1,708 | 1,708 | 2 | 2 | – |
| | | | | | | | Non-commissioned officer's rooms between barrack rooms. |
| | Huts: Wood Hut, Europa | 1 | 2,071 each room | | 1 | 1 | – |
| | ,, | 5 | 2,071 each room | | 2 | 2 | 2 |
| | Huts: Servants kitchen, Europa hospital | 5 | 3,114 | 3,114 | 1 | 1 | – |
| | Huts: Europa Pass | 1 | 9,347 | | 4 | 4 | 5 |
| | Huts: Hut, Europa Pass | 2 | 9,372 | | 4 | 4 | 5 |
| | ,, | 3 | 9,091 | | 4 | 4 | 2 |
| | ,, | 4 | 7,609 | | 4 | 4 | 7 |
| | ,, | 5 | 21,820 | | 5 | 5 | 4 |
| | ,, | 8 | 9,438 | | 5 | 5 | 11 |
| | Huts: Hut, Buena Vista | 3 | 1,553 | | 1 | 1 | 1 |
| | | | | | | | Non-commissioned officer's room between barrack rooms. |
| | Buildings: Kitchen, Buena Vista | 2 | 1,230 | | 1 | 1 | 2 |
| | Buildings: Kitchen, Buena Vista | 3 | 1,230 | | 1 | 1 | – |
| | Buildings: N.C.O. room Buena Vista | 1 | 1,620 | | 1 | 1 | 1 |
| | Buildings: ,, | 2 | 1,620 | | 1 | 1 | – |
| | Buildings: Room, Naval hospital | 6 | 5,036 | | 1 | 1 | 2 |
| | Buildings: Porter's lodge, do. | — | 2,527 | | 1 | 1 | 2 |
| | Buildings: North Front | — | — | | 1 | 1 | 1 |
| | Buildings: District school, Windmill Hill Road | — | 5,572 | | 1 | 1 | 2 |
| | 5 tents at Buena Vista | — | 1,233 each. | | 5 | 5 | 4 |
| 2nd Batt. 8th Regiment. | Building | 2 | 3,185 | | 1 | 1 | 1 |
| | ,, | 4 | 3,185 | | 1 | 1 | 2 |
| | ,, | 1 | 2,862 | | 1 | 1 | 4 |
| | Kitchen | — | 940 | | — | 1 | — |
| | Building | — | 4,452 | | 1 | 1 | 1 |
| | ,, | — | 2,540 | | 1 | 1 | 2 |

* The buildings marked thus * are Government buildings, the remainder have been built at different periods by the men of the corps.

B.—Number of Wooden Huts or other Buildings, &c.—*continued.*

| Corps. | Whether Hut or Building. | No. of Hut or Building. | Dimensions with cubic Contents. | Occupied by | | | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | | No. of Men. | No. of Women. | No. of Children. | |
| | | | cubic feet. | | | | |
| 2nd Batt. 8th Regiment. | Building | 6 | 1,799 | 1 | 1 | 1 | Servants' room. |
| | " | 7 | 1,799 | 1 | 1 | 2 | Ditto. |
| | " | 9 | 1,799 | 1 | 1 | – | Ditto. |
| | " | 11 | 1,799 | 1 | 1 | 3 | Ditto. |
| | " | 16 | 1,799 | 1 | 1 | – | Ditto. |
| | Building, Bayside guard room | — | 2,560 | 1 | 1 | 2 | Guard room. |
| | Building, servants' room | — | 2,560 | 1 | 1 | – | Servants' room. |
| 1st Batt. 25th Regiment. | Building | 2 | 2,903 | 1 | 1 | 4 | |
| | " | 3 | 1,954 | 1 | 1 | – | |
| | " | 4 | 1,954 | 1 | 1 | – | |
| | " | 5 | 2,182 | 1 | 1 | 1 | |
| | " | 6 | 2,225 | 1 | 1 | 1 | |
| | " | 7 | 2,131 | 1 | 1 | 1 | |
| | " | 8 | 3,022 | 1 | 1 | 2 | |
| | " | 9 | 3,064 | 1 | 1 | 2 | |
| | " (serjeant-major) | 10& 11 | 4,504 | 1 | 1 | – | |
| | " | 12 | 1,514 | 1 | 1 | 1 | Non-commissioned officers' quarters in rear of South barracks. |
| | " | 13 | 1,514 | 1 | 1 | 2 | |
| | " | 15 | 1,633 | 1 | 1 | 3 | |
| | " | 16 | 1,633 | 1 | 1 | 1 | |
| | " | 18 | 1,534 | 1 | 1 | 1 | |
| | " | 19 | 1,514 | 1 | 1 | 3 | |
| | " | 20 | 1,543 | 1 | 1 | 2 | |
| | " | 21 | 1,973 | 1 | 1 | 1 | |
| | " | 22 | 1,660 | 1 | 1 | 1 | |
| | " | 24 | 1,336 | 1 | 1 | – | |
| | " | 25 | 4,361 | 1 | 1 | 5 | |
| | " | — | — | 1 | 1 | – | Provision store, Rosia. |
| | " | — | — | 1 | 1 | 3 | Shoemakers' shop, Rosia. |
| | Stone building | — | — | 1 | 1 | 1 | Old Serjeants' mess. |
| | " | 2 | — | 1 | 1 | 2 | |
| | " | 3 | — | 1 | 1 | 2 | |
| | Building | 3 | 8,600 | 5 | 5 | 6 | |
| | " | 4 | 8,600 | 5 | 5 | 7 | Sheds, Buena Vista. |
| | " | 5 | 14,560 | 9 | 9 | 11 | |
| 100th Regiment - | Hut, North Front | 1 | 2,986 | 3 | 3 | 6 | |
| | " | 2 | 2,986 | 3 | 3 | 4 | |
| | " | 3 | 2,986 | 3 | 3 | 6 | |
| | " | 4 | 2,986 | 2 | 2 | 6 | |
| | " | 5 | 2,986 | 3 | 3 | 4 | |
| | " | 6 | 2,986 | 3 | 3 | 6 | |
| | Tents, North Front | 1 | 1,853 | 1 | 1 | 1 | |
| | " | 2 | 1,853 | 1 | 1 | 2 | |
| | " | 3 | 1,853 | 1 | 1 | 2 | |
| | Building, Casemate | — | 4,372 | 1 | 1 | 2 | Serjeant Major. |
| | " | — | 2,600 | 1 | 1 | 3 | Quartermaster Serjeant. |
| | " | — | 1,270 | 1 | 1 | 3 | Library. |
| | " | — | 4,260 | 1 | 1 | 1 | Tailors' shop. |
| | " | 3 | 1,822 | 1 | 1 | 1 | |
| | " | 4 | 1,822 | 1 | 1 | – | |
| | " | 5 | 1,822 | 1 | 1 | 2 | Non-commissioned officers' quarters. |
| | " | 7 | 1,822 | 1 | 1 | – | |
| | " | 12 | 1,455 | 1 | 1 | 1 | |
| | " | — | 5,577 | 1 | 1 | 2 | Schoolmistress. |
| | Retrenchment barrack | 12<br>13 | 7,552 | 1 | 1 | – | Bandmaster. |

C. Estimate of the Numbers of Married Non-commissioned Officers and Soldiers for whom separate provision would be necessary in the event of the existing accommodation in Barrack-rooms, Huts, and other buildings being withdrawn, the object being to ascertain what Numbers of Quarters of a separate room each, is required to meet the necessities of the Garrison.

1.—*Royal Artillery.*

If the existing accommodation in barrack rooms, huts, &c., were withdrawn, the number of quarters of a separate room each required by the Royal Artillery would be (cottages excluded), 43.

2.—*Royal Engineers.*

Should the whole of the existing accommodation, except that in Hargraves and Town Range barracks, be withdrawn, 26 quarters would be required; but should that also be withdrawn, 33 quarters would be required.

3.—*2nd Battalion 6th Regiment.*

| — | 1st Class Staff Serjeants. | 2nd Class Staff Serjeants. | 3rd Class Staff Serjeants. | N. C. Officers, Rank and File. | Total Married. |
|---|---|---|---|---|---|
| Required for the present effective strength excluding schoolmasters. | 2 | 3 | — | 29 | 34 |

By War Office Circular, No. 318, dated 17th Sept. 1858, the following numbers are permitted to be borne on the establishment of corps serving with regiments abroad, viz. :—

| — | | 1st Class Staff Serjeants. | 2nd Class Staff Serjeants. | 3rd Class Staff Serjeants. | N. C. Officers, Rank and File. | Total Wives authorized. |
|---|---|---|---|---|---|---|
| Class A. | Serjeant Major | 1 | – | – | – | 1 |
| | Quartermaster Serj. | 1 | – | – | – | 1 |
| | Serjeant Instructor of Musketry | 1 | – | – | – | 1 |
| Class B. | Paymaster Serj. | – | 1 | – | – | 1 |
| | Armourer Serjeant | – | 1 | – | – | 1 |
| | Hospital Serjeant * | – | 1 | – | – | 1 |
| | Orderly Room Serjt. | – | 1 | – | – | 1 |
| | Drum Major | – | 1 | – | – | 1 |
| 10 Companies, with 2 Serjeants' wives each | | – | – | – | 20 | 20 |
| 800 Rank and File, 6 women per cent. | | – | – | – | 48 | 48 |
| Number of separate quarters required for the authorized establishment, excluding schoolmasters and unmarried colour serjeants | | 3 | 5 | – | 68 | 76 |

* The 2nd Battalion 6th Regiment has no hospital serjeant.

Schoolmasters are exclusive from the above, being provided with special quarters.

By Circular No. 698, dated War Office, 27th July 1861, colour serjeants of infantry are classed with 2nd class staff serjeants, for allowances of fuel and light, &c., and are entitled to a separate room each; as some of them are generally unmarried (in this battalion only two of the eight serjeants have wives), it will follow that a regiment having its full establishment of married non-commissioned officers and soldiers will require not less *than eighty* separate rooms for their accommodation.

4.—*2nd Battalion, 7th Regiment.*

Seventy-five. (75).

5.—*2nd Battalion, 8th Regiment.*

| | |
|---|---|
| Staff Serjeants | 7 |
| Serjeants, 2 per company | 20 |
| Drummers, rank and file, 6 per cent. on establishment | 49 |

6.—*1st Battalion, 25th Regiment.*

For the service companies of a battalion:—

| Serjeants. | Drummers. | R. & File. | Total. |
|---|---|---|---|
| 47 | 20 | 800 | 867 |

| Number of Staff Serjeants. | Other Serjeants, at the rate of two per Company. | Drummers, and Rank and File, at the rate of six per cent. | Number of separate rooms necessary for the married N.C.O. and soldiers of a Battalion. |
|---|---|---|---|
| 7 | 20 | 49 | 76 |

*Remarks.*—Vide W. O. Circular, No. 419, 29th April 1859.

7.—*100th Regiment.*

| | | | |
|---|---|---|---|
| 1st Class Staff Serjeants | 5 | Serjeant Major. | |
| | | Quartermaster Serjeant. | |
| | | Serjeant Instructor of Musketry. | |
| | | Schoolmaster. | |
| | | Schoolmistress. | |
| 2nd „ | 4 | Drum Major. | |
| | | Armourer Serjeant. | |
| | | Colour Serjeant McCarthy. | |
| | | Colour Serjeant Hudson. | |
| Serjeants | 7 | | |
| Rank and File | 35 | | |
| Total | 51 | Present strength at head quarters. | |

Total number allowed for establishment of regiment, vide W. O. Circular of 29th April 1859, No. 419 $\frac{9656}{21}$.

77 of all ranks.

True copies from Returns furnished by regiments and corps.

Gibraltar,
4th November 1861.

H. H. Maude,
A. A. G.

## No. 1.—Monthly Abstract of Meteorological Observations made by the Royal Engineer Department, Malta, 1859.

Latitude 35° 53′ 49″ N., longitude 14° 30′ 28″ E.; station 232 feet above the sea.

| — | — | Barometer. | | Thermometer. | | | | Hygrometer. | | | | | | Self-registering Thermometers. | | | | | | Rain. | | Wind. | | | | Cloud. | | Maxima and Minima of Month. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inches. | Inches. | Temp. in Air. | | Temp. of Evap. | | Temp. of Dew-point. | | Elas. Force of Evap. | | Humidity 0—1. | | Max. Sun. | Min. Gras. | Max. Air. | Min. Air. | Max. Wet. | Min. Wet. | Inches in 24 hours. | | Pres. in lbs. per Sq. Foot. | Direction—Times. | | | 0—10. | | | |
| | | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | | | | | | | On Ground. | Above Ground. | 9½ A.M. | 3½ PM. | — | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | Temp. | Rain. |
| January | Max. | 30·313 | 30·251 | 60° | 60° | 57° | 56° | 54·6 | 54·6 | ·441 | ·437 | ·934 | ·934 | 83° | 49° | 63° | 54° | 59° | 51° | 1·900 | 1·950 | 3·00 | 3·25 | N. | 4 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 1 | 0 | 10 | 10 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 3 | 4 | | | | |
| | Mean | 29·944 | 29·923 | 54·6 | 55·5 | 51·2 | 51·8 | 48·5 | 48·2 | ·356 | ·361 | ·815 | ·802 | 67·6 | 43° | 57·7 | 49·8 | 55·5 | 41° | ·220 | ·213 | ·53 | ·67 | S.W. | 2 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 1 | 1 | 8 | 7 | Max.=65° on 31st. Min.=45° on 9th. Range=20°. | Total fall=6·810 inch. Max. in 24 h.=1·9 inch on 26th. |
| | Min. | 29·548 | 29·553 | 50° | 52° | 46° | 48° | 42° | 43° | ·283 | ·283 | ·665 | ·665 | 55° | 32° | 55° | 45° | 51° | 42° | ·000 | ·000 | ·000 | ·000 | S.E. | 2 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 8 | 8 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 10 | 12 | 1 | 1 | | |
| February | Max. | 30·124 | 30·077 | 63° | 64° | 59° | 59° | 56·2 | 55·2 | ·461 | ·450 | ·944 | ·888 | 85° | 49° | 65° | 56° | 60° | 52° | ·805 | ·800 | 2·00 | 4·50 | N. | 4 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 7 | 7 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 3 | 6 | | | | |
| | Mean | 29·784 | 29·746 | 56° | 57·2 | 52·3 | 52·9 | 49·4 | 49·8 | ·371 | ·376 | ·804 | ·784 | 71·1 | 40·9 | 59·5 | 49° | 56·6 | 46·9 | ·080 | ·078 | ·49 | ·68 | S.W. | 4 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 4 | 4 | | | Max.=65° on 1st. Min.=39° on 21st. Range=26°. | Total rain=2·256 inch. Max.=·803 in on 16th. |
| | Min. | 29·395 | 29·376 | 42° | 46° | 39° | 41° | 35·4 | 35·7 | ·225 | ·226 | ·668 | ·665 | 60° | 31° | 50° | 39° | 45° | 35° | ·000 | ·000 | ·000 | ·000 | S.E. | 2 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | 0 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 3 | 5 | | | | |
| March | Max. | 30·213 | 30·181 | 65° | 66° | 62° | 62° | 60·2 | 59·6 | ·527 | ·516 | ·944 | ·944 | 84° | 50° | 68° | 59° | 63° | 56° | ·300 | ·285 | 3·25 | 3·75 | N. | 2 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 10 | 6 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 5 | 8 | 10 | 10 | | |
| | Mean | 29·835 | 29·792 | 59·3 | 60·8 | 58·8 | 56·5 | 53·1 | 53·1 | ·420 | ·423 | ·817 | ·729 | 73·5 | 42·9 | 62·7 | 53° | 59° | 50·2 | ·042 | ·038 | ·79 | ·72 | S.W. | 1 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 2 | 3 | 5 | 5 | Max.=68° on 10th. Min.=46° on 2nd. Range=22°. | Total rain=1·32 inch. Max.=·300 in. on 21st. |
| | Min. | 29·411 | 29·254 | 48° | 54° | 46° | 48° | 43·8 | 43·1 | ·302 | ·295 | ·666 | ·665 | 61° | 38° | 58° | 46° | 56° | 41° | ·000 | ·000 | ·000 | ·000 | S.E. | 5 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 3 | 4 | 0 | 0 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 3 | 2 | | | | |
| April | Max. | 30·111 | 30·020 | 84° | 88° | 70° | 73° | 66·0 | 66·0 | ·638 | ·638 | ·893 | ·854 | 100° | 51° | 93° | 69° | 74° | 62° | ·125 | ·115 | 4·00 | 3·5 | N. | 0 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 7 | 9 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 7 | 4 | 10 | 10 | | |
| | Mean | 29·744 | 29·705 | 66° | 68° | 61° | 62° | 57·5 | 57·0 | ·484 | ·509 | ·752 | ·728 | 82·6 | 42·9 | 71·9 | 57° | 63·6 | 54° | ·006 | ·005 | ·79 | ·69 | S.W. | 5 | 4 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 2 | 5 | 4 | 4 | Max.=93° on 21st. Min.=48° on 3rd. Range=45°. | Total rain=·175 inch. Max.=·125 in. on 13th. |
| | Min. | 29·338 | 29·307 | 54° | 54° | 47° | 50° | 40·0 | 51·0 | ·234 | ·316 | ·482 | ·487 | 66° | 35° | 59° | 48° | 55° | 44° | ·000 | ·000 | ·000 | ·000 | S.E. | 2 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 5 | 5 | 0 | 0 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 2 | 1 | | | | |
| May | Max. | 29·802 | 29·796 | 75° | 82° | 69° | 72° | 66·0 | 70·5 | ·638 | ·739 | ·897 | ·865 | 94° | 61·0 | 79° | 65° | 72° | 62° | ·200 | ·190 | 5·50 | 7·50 | N. | 5 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 10 | 10 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 1 | 3 | 10 | 10 | | |
| | Mean | 29·636 | 29·622 | 68·5 | 70° | 64° | 65·3 | 62·0 | 62·6 | ·553 | ·572 | ·798 | ·775 | 83·9 | 47·1 | 73° | 61° | 66° | 59° | ·010 | ·009 | ·95 | ·78 | S.W. | 3 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 2 | 0 | 4 | 4 | Max.=79° on 27th. Min.=57° on 7th. Range 22°. | Total rain=·325 inch. Max.=·200 in. on 8th. |
| | Min. | 29·342 | 26·319 | 64° | 62° | 59° | 59° | 58·4 | 56·9 | ·450 | ·472 | ·709 | ·618 | 71° | 36° | 67° | 57° | 62° | 54° | ·025 | ·015 | ·25 | ·25 | S.E. | 1 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 5 | 4 | 0 | 0 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 4 | 5 | | | | |
| June | Max. | 29·929 | 29·925 | 83° | 86° | 74° | 75° | 72° | 70° | ·776 | ·727 | ·907 | ·823 | 104° | 66° | 87° | 70° | 78° | 67° | — | — | 6·0 | 7·50 | N. | 1 | 0 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 16 | 12 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 2 | 6 | | | | |
| | Mean | 29·767 | 29·744 | 74·9 | 77·8 | 69·2 | 69·9 | 66·2 | 65·9 | ·646 | ·638 | ·758 | ·718 | 92·4 | 60·5 | 79·8 | 65·9 | 72·5 | 63° | — | — | ·90 | 1·48 | S.W. | 1 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 0 | 0 | | | Max.=87° on 16th & 30th. Min.=61° on 6th. Range=26°. | None. |
| | Min. | 29·500 | 29·512 | 69° | 72° | 62° | 66° | 57·8 | 61° | ·486 | ·541 | ·588 | ·559 | 84° | 49° | 74° | 61° | 69° | 59° | — | — | — | — | S.E. | 4 | 4 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 3 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 3 | 4 | | | | |

MONTHLY ABSTRACT of METEOROLOGICAL OBSERVATIONS made by the ROYAL ENGINEER DEPARTMENT, 1859—*continued*.

| | | Barometer. | | Thermometer. | | | | Hygrometer. | | | | | | Self-registering Thermo met ers | | | | | | Rain. | | Wind. | | | | Cloud. | | Maxima and Minima of Month. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inches. | Inches. | Temp. in Air. | | Temp. of Evap. | | Temp. of Dew-point. | | Elas. Force of Evap. | | Humidity 0—1. | | Max. Sun. | Min. Gras. | Max. Air. | Min. Air. | Max. Wet. | Min. Wet. | Inches in 24 hours. | | Pres. in lbs. per Sq. Foot. | | Direction—Times. | | | 0—10. | | Temp. | Rain. |
| | | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | | | | | | | On Ground. | Above Ground. | 9½ AM. | 3½ PM. | — | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | | |
| July | Max. | 29·944 | 29·949 | 89° | 91° | 79° | 81° | 75° | 75·6 | ·854 | ·910 | ·787 | ·785 | 108° | 70° | 93° | 75° | 81° | 71° | — | — | 1·75 | 3·50 | N. | 5 | 4 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 13 | 7 | 7 | 7 | Max. = 93° on 7th. | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 1 | 5 | | | | |
| | Mean | 29·802 | 29·777 | 81·9 | 84·6 | 74·4 | 75·2 | 70·5 | 70·4 | ·746 | ·741 | ·698 | ·640 | 99·4 | 65·1 | 86° | 70·5 | 77·3 | 68° | — | — | ·33 | ·56 | S.W. | 0 | 2 | 1·8 | 2 | Min. = 66° on 1st, 19th, and 30th. | None. |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 0 | 1 | | | | |
| | Min. | 29·657 | 29·629 | 75° | 78° | 69° | 71° | 65·5 | 66° | ·628 | ·638 | ·535 | ·535 | 87° | 58° | 79° | 66° | 74° | 64° | — | — | ·00 | ·00 | S.E. | 0 | 1 | 0 | 0 | Range = 27°. | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | 0 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 11 | 11 | | | | |
| August | Max. | 29·846 | 29·820 | 87° | 90° | 80° | 81° | 77·5 | 78° | ·925 | ·940 | ·789 | ·753 | 110° | 70° | 93° | 77° | 85° | 75° | ·065 | ·055 | 1·50 | 3° | N. | 5 | 4 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 10 | 3 | 10 | 9 | Max. = 93° on 31st. | Total rain = ·065 in. on 24th. |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 4 | 5 | | | | |
| | Mean | 29·739 | 29·707 | 83·6 | 86·4 | 76·9 | 77·5 | 73·5 | 73° | ·819 | ·804 | ·727 | ·654 | 102·7 | 67° | 88° | 73° | 80° | 71° | ·002 | ·002 | ·15 | ·33 | S.W. | 2 | 2 | 3 | 2 | Min. = 68° on 27th. | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 1 | 0 | | | | |
| | Min. | 29·587 | 29·528 | 79° | 82° | 71° | 70° | 70° | 64° | ·680 | ·597 | ·680 | ·559 | 95° | 60° | 83° | 68° | 76° | 66° | ·000 | ·000 | ·000 | ·25 | S.E. | 3 | 3 | 0 | 0 | Range = 25°. | Maltese fever very prevalent. |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 5 | 13 | | | | |
| September | Max. | 30·026 | 29·988 | 81° | 83° | 75° | 74° | 73° | 71° | ·801 | ·751 | ·825 | ·786 | 102° | 69° | 87° | 76° | 81° | 72° | ·135 | ·125 | 2·50 | 3·75 | N. | 1 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 13 | 7 | 10 | 10 | Max. = 87° on 1st. | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 2 | 4 | | | | |
| | Mean | 29·803 | 29·779 | 77·5 | 79° | 71·3 | 71·5 | 67·6 | 67° | ·677 | ·673 | ·729 | ·694 | 94° | 59·6 | 80° | 68° | 74·9 | 65·2 | ·115 | ·105 | ·55 | ·76 | S.W. | 1 | 1 | 3 | 3 | Min. = 63° on 21st. | Total rain = ·250 in. |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 4 | 4 | | | | |
| | Min. | 29·517 | 29·511 | 73° | 74° | 65° | 65° | 58° | 60·5 | ·532 | ·532 | ·610 | ·614 | 84° | 54° | 75° | 63° | 69° | 69° | ·008 | ·007 | ·25 | ·25 | S.E. | 0 | 0 | 1 | 1 | Range = 24°. | Max. = ·135 in. on 19th. |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | 0 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 8 | 13 | | | | |
| October | Max. | 30·053 | 30·038 | 82° | 87° | 75° | 79° | 72·5 | 75° | ·787 | ·854 | ·824 | ·786 | 107° | 68° | 89° | 78° | 88° | 71° | — | — | 3·75 | 1·75 | N. | 1 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 9 | 9 | 10 | 10 | Max. = 89° on 11th. | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 4 | 2 | | | | |
| | Mean | 29·798 | 29·761 | 77·4 | 78·2 | 71·6 | 70·8 | 68·6 | 67·3 | ·753 | ·665 | ·757 | ·710 | 97·4 | 57·9 | 81·5 | 69·3 | 76·6 | 65° | — | — | ·37 | ·33 | S.W. | 8 | 6 | 4 | 4 | Min. = 64° on 27th. | Slight showers too little to register. |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 3 | 4 | | | | |
| | Min. | 29·616 | 29·615 | 74° | 72° | 67° | 65° | 63·5 | 61·5 | ·588 | ·550 | ·678 | ·559 | 88° | 50° | 76° | 64° | 72° | 61° | — | — | ·0 | ·0 | S.E. | 2 | 1 | 0 | 0 | Range = 25°. | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 0 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 4 | 5 | | | | |
| November | Max. | 29·998 | 29·962 | 76° | 77° | 70° | 72° | 67·5 | 67·5 | ·670 | ·715 | ·946 | ·944 | 100° | — | 79° | 68° | 76° | 65° | 1·650 | 1·850 | 5·50 | 8° | N. | 0 | 0 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 8 | 7 | 10 | 10 | Max. = 79° on 6th. | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 3 | 2 | | | | |
| | Mean | 29·753 | 29·728 | 62·2 | 66·7 | 62·2 | 62·4 | 59·8 | 58·2 | ·527 | ·527 | ·816 | ·806 | 82·9 | — | 69·8 | 60·7 | 68° | 57·4 | ·220 | ·206 | 1·25 | 1·20 | S.W. | 2 | 2 | 7 | 7 | Min. = 50° on 19th. | Total rain = 6·015 in. |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 2 | 3 | | | | |
| | Min. | 29·266 | 29·281 | 52° | 57° | 51° | 55° | 50° | 53·2 | ·388 | ·416 | ·619 | ·643 | 70° | — | 61° | 50° | 60° | 48° | ·015 | ·015 | ·25 | ·25 | S.E. | 6 | 2 | 2 | 1 | Range = 29°. | Max. = 1·650 in. on 15th. |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 8 | 11 | | | | |
| December | Max. | 29·984 | 30·016 | 65° | 65° | 62° | 62° | 60·2 | 60·2 | ·527 | ·527 | ·944 | ·944 | 92° | — | 67° | 63° | 66° | 59° | ·600 | ·600 | 7·50 | 6·00 | N. | 3 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 9 | 6 | 10 | 10 | Max. = 67° on 1st, 2nd, 7th, and 20th. | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 6 | 6 | | | | |
| | Mean | 29·743 | 29·718 | 58° | 58·1 | 54·2 | 53·7 | 51·2 | 50·5 | ·396 | ·384 | ·799 | ·776 | 71·4 | — | 61·4 | 52·9 | 59·7 | 49·1 | ·100 | ·096 | 1·41 | 1·21 | S.W. | 6 | 8 | 6 | 7 | Min. = 44° on 17th. | Total rain = 3·130 in. |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 0 | 0 | | | | |
| | Min. | 29·424 | 29·373 | 51° | 48° | 47° | 45° | 41° | 39·7 | ·274 | ·262 | ·662 | ·591 | 62° | — | 53° | 44° | 55° | 41° | ·015 | ·015 | ·25 | ·25 | S.E. | 2 | 2 | 1 | 2 | Range = 23°. | Max. = ·600 in. on 25th. |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | 0 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 4 | 6 | | | | |

## RESULTS OF METEOROLOGICAL OBSERVATIONS made by the ROYAL ENGINEER DEPARTMENT, MALTA, 1860.

Latitude 35° 53′ 49″, longitude 14° 30′ 28″ E. ; Station 232 feet above the sea.

| —— | — | Barometer. | | Thermometer. | | | | Hygrometer. | | | | | | Self-registering Thermometers. | | | | | | Rain. | | Wind. | | | | Cloud. | | Maxima and Minima of Month. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inches. | Inches. | Temp. in Air. | | Temp. of Evap. | | Temp. of Dew-point. | | Elas. Force of Evap. | | Humidity 0—1. | | Max. Sun. | Min. Gras. | Max. Air. | Min. Air. | Max. Wet. | Min. Wet. | Inches in 24 hours. | | Pres. in lbs. per Sq. Foot. | | Direction—Times. | | | 0—10. | | | |
| | | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | | | | | | | On Ground | Above Ground | 9½ AM. | 3½ PM. | — | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | Temp. | Rain. |
| January | Max. | 30·175 | 30·142 | 63· | 66· | 60· | 62· | 57·6 | 60·2 | ·488 | ·527 | ·893 | ·944 | 92· | — | 69· | 59· | 69· | 55· | ·250 | ·250 | 6· | 4·50 | N. | 1 | 2 | | | | |
| | Mean | 29·873 | 29·836 | 58· | 59· | 54· | 55· | 52·2 | 52·1 | ·404 | ·414 | ·813 | ·794 | 72· | — | 61· | 54· | 60· | 50· | ·028 | ·024 | ·89 | ·97 | N.W. | 10 | 10 | 10 | 10 | Max. = 69° on 7th. Min. = 48° on 18th. Range = 21°. | Total fall = ·875 inch. Max. in 24 hours = ·250 in. on 22nd. |
| | Min. | 29·521 | 29·504 | 54· | 52· | 51· | 49· | 47·5 | 44·8 | ·335 | ·312 | ·747 | ·710 | 64· | — | 57· | 48· | 53· | 45· | ·015 | ·015 | ·25 | ·25 | W. | 5 | 7 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.W. | 6 | 4 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 1 | 1 | 5 | 6 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.E. | 4 | 5 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | — | 1 | 2 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 3 | 2 | | | | |
| February | Max. | 30·057 | 29·937 | 62· | 62· | 59· | 60· | 56·9 | 57·6 | ·472 | ·483 | ·931 | ·891 | 88· | — | 65· | 58· | 75· | 54· | ·425 | ·450 | 11· | 9· | N. | 3 | — | | | | |
| | Mean | 29·614 | 29·586 | 54· | 56· | 51· | 52· | 48·4 | 48·6 | ·358 | ·359 | ·813 | ·773 | 71· | — | 59· | 50· | 59· | 45· | ·059 | ·052 | 1·93 | 2·47 | N.W. | 8 | 9 | | | Max. = 65° on 3rd. Min. = 40° on 22nd. Range = 25°. | Total fall = 1·725 inch. Max. in 24 hours = .425 in. on 24th. |
| | Min. | 29·299 | 29·316 | 44· | 49· | 44· | 46· | 41·0 | 40·0 | ·238 | ·264 | ·615 | ·662 | 61· | — | 55· | 40· | 53. | 30· | ·035 | ·025 | ·25 | ·25 | W. | 8 | 5 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.W. | 5 | 9 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 2 | 1 | 6 | 6 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.E. | — | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 2 | 3 | | | | |
| March | Max. | 30·041 | 30·040 | 65· | 67. | 61· | 63· | 58·6 | 60·6 | ·499 | ·534 | ·893 | ·944 | 88· | — | 75· | 59· | 66· | 57· | ·200 | ·175 | 4·50 | 4·50 | N. | 1 | 2 | | | | |
| | Mean | 29·696 | 29·660 | 57· | 58. | 53· | 54· | 50·7 | 51·0 | ·388 | ·397 | ·810 | ·780 | 74· | — | 61· | 51· | 59· | 48· | ·037 | ·030 | ·91 | 1·14 | N.W. | 12 | 10 | 10 | 10 | Max. = 75° on 31st. Min. = 45° on 7th. Range = 30°. | Total fall = 1·150 inch. Max. in 24 hours = ·200 in. on 19th. |
| | Min. | 29·334 | 29·317 | 50· | 52· | 49· | 48· | 43· | 43·1 | ·293 | ·295 | ·687 | ·665 | 62· | — | 55· | 45· | 53· | 42· | ·000 | ·000 | — | — | W. | 7 | 7 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.W. | 2 | 4 | 6 | 5 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 1 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.E. | 2 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | — | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 6 | 3 | | | | |
| April | Max. | 29·890 | 29·862 | 71· | 72· | 67· | 67· | 65·8 | 64·5 | ·634 | ·607 | ·902 | ·853 | 89· | — | 76· | 63· | 71· | 59· | ·094 | ·075 | 3·50 | 4·50 | N. | 1 | 2 | | | | |
| | Mean | 29·684 | 29·647 | 63· | 63· | 59· | 59· | 55·0 | 56·4 | ·478 | ·468 | ·816 | ·784 | 78· | — | 66· | 55· | 63· | 53· | ·004 | ·003 | 1·05 | 1·17 | N.W. | 9 | 11 | 10 | 10 | Max. = 76° on 28th. Min. = 50° on 25th. Range = 26°. | Total fall = ·140 inch. Max. in 24 hours = ·094 in. on 13th. |
| | Min. | 29·414 | 29·401 | 53· | 56· | 51· | 54· | 49·0 | 49·8 | ·361 | ·371 | ·711 | ·751 | 70· | — | 59· | 50· | 59· | 47· | ·045 | ·035 | ·28 | ·25 | W. | 3 | 5 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.W. | 3 | 3 | 5 | 5 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 3 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.E. | 6 | 4 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 2 | — | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 3 | 3 | | | | |
| May | Max. | 29·948 | 29·912 | 77· | 81· | 69· | 70· | 66· | 64·5 | ·638 | ·607 | ·898 | ·898 | 104· | — | 84· | 64· | 74· | 61· | ·115 | ·100 | 3·25 | 3·50 | N. | 4 | 3 | | | | |
| | Mean | 29·745 | 29·732 | 68· | 70· | 63· | 64· | 60·3 | 61·0 | ·531 | ·544 | ·774 | ·737 | 90· | — | 73· | 59· | 67· | 57· | ·008 | ·006 | ·50 | ·78 | N.W. | 15 | 14 | 9 | 9 | Max. = 84° on 12th. Min. = 53° on 5th. Range = 31°. | Total fall = ·255 inch. Max. in 24 hours = ·115 in. on 23d. |
| | Min. | 29·466 | 29·513 | 58· | 60· | 55· | 57· | 59·2 | 54·2 | ·412 | ·431 | ·676 | ·585 | 79· | — | 64· | 53· | 60· | 52· | ·040 | ·030 | ·25 | ·25 | W. | 3 | 5 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.W. | 2 | 2 | 3 | 4 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 3 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.E. | 2 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | — | 1 | 1 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 1 | 1 | | | | |
| June | Max. | 29·912 | 29·858 | 87· | 90· | 76· | 77· | 71·5 | 72· | ·763 | ·776 | ·786 | ·748 | 110· | — | 93· | 75· | 81· | 69· | — | — | 2·00 | 2·50 | N. | 7 | 1 | | | | |
| | Mean | 29·750 | 29·725 | 78· | 81· | 70· | 72· | 67·3 | 67·6 | ·668 | ·675 | ·709 | ·650 | 98· | — | 83· | 67· | 74· | 64· | — | — | ·20 | ·18 | N.W. | 6 | 8 | 8 | 10 | Max. = 93° on 29th. Min. = 61° on 1st. Range = 32°. | No rain. |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | — | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.W. | — | 1 | | | | |
| | Min. | 29·570 | 29·442 | 74· | 76· | 66· | 66· | 63·0 | 61·0 | ·559 | ·541 | ·591 | ·512 | 90· | — | 78· | 61· | 70· | 59· | — | — | ·25 | ·25 | S. | — | — | 2 | 2 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S.E. | 9 | 7 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 3 | 4 | 1 | 1 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 5 | 8 | | | | |

MONTHLY ABSTRACT of METEOROLOGICAL OBSERVATIONS made by the ROYAL ENGINEER DEPARTMENT, 1860—*continued.*

| — | — | Barometer. | | Thermometer. | | | | Hygrometer. | | | | | | Self-registering Thermometers. | | | | | | Rain. | | Wind. | | | | Cloud. | | Maxima and Mimima of Month. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inches. | Inches. | Temp. in Air. | | Temp. of Evap. | | Temp. of Dew-point. | | Elas. Force of Evap. | | Humidity 0—1. | | Max. Sun. | Min. Gras. | Max. Air. | Min. Air. | Max. Wet. | Min. Wet. | Inches in 24 hours. | | Pres. in lbs. per Sq. Foot. | Direction—Times. | | | 0—10. | | Temp. | Rain. |
| | | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | ½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | | | | | | | On Ground. | Above Ground. | 9½ AM. | 3½ PM. | | 9½ AM. | 3½ PM. | 9½ AM. | 3½ PM. | | |
| July | Max. | 29·828 | 28·806 | 86· | 88· | 77· | 78· | 74·0 | 74·0 | ·827 | ·827 | ·826 | ·824 | 108· | — | 92· | 75· | 82· | 73· | — | — | 2·00 | 2·75 | N. | 4 | 5 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 17 | 14 | 10 | 10 | Max. = 92° on 1st. | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 2 | 4 | | | Min. = 67° on 6th. | No rain. |
| | Mean | 29·687 | 29·671 | 79· | 83· | 71· | 72· | 68·2 | 68·0 | ·698 | ·680 | ·709 | ·643 | 95· | — | 83· | 70· | 77· | 68· | — | — | ·66 | ·87 | S.W. | — | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 1 | — | 1 | 1 | Range = 25°. | |
| | Min. | 29·473 | 29·485 | 74· | 72· | 66· | 67· | 62·0 | 62·0 | ·617 | ·559 | ·589 | ·487 | 85· | — | 76· | 67· | 73· | 64· | — | — | ·25 | ·25 | S.E. | 2 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | 2 | 1 | 1 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 4 | 2 | | | | |
| August | Max. | 29·903 | 29·834 | 97· | 93· | 83· | 83· | 79·5 | 79·4 | ·986 | ·986 | ·788 | ·788 | 119· | — | 101· | 82· | 89· | 76· | — | — | 1·50 | ·75 | N. | 9 | 8 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 7 | 5 | 9 | 9 | Max. = 101° on 17th. | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 3 | 2 | | | Min. = 66° on 2nd. | No rain. |
| | Mean | 29·773 | 29·742 | 83· | 85· | 76· | 78· | 72·1 | 72·3 | ·751 | ·788 | ·709 | ·655 | 102· | — | 88· | 73· | 81· | 70· | — | — | ·20 | ·22 | S.W. | — | 1 | 1 | 1 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 3 | 3 | | | Range = 35°. | |
| | Min. | 29·658 | 29·626 | 76· | 78· | 67· | 70· | 62·5 | 66·0 | ·568 | ·638 | ·563 | ·537 | 89· | — | 79· | 66· | 73· | 64· | — | — | ·25 | ·25 | S.E. | 1 | — | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | — | — | 1 | 1 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 8 | 12 | | | | |
| September | Max. | 30·288 | 30·022 | 93· | 99· | 84· | 89· | 80·4 | 85·0 | ·988 | 1·180 | ·827 | ·870 | 120· | — | 100· | 80· | 89· | 78· | — | — | 2·50 | 5·50 | N. | 5 | 3 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 7 | 7 | 7 | 9 | Max. = 100° on 18th. | |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 3 | 3 | | | Min. = 65° on 23rd and 24th. | No rain. |
| | Mean | 29·825 | 29·783 | 82· | 84· | 76· | 76· | 72·7 | 72·8 | ·804 | ·801 | ·742 | ·720 | 97· | — | 86· | 72· | 80· | 70· | — | — | ·40 | ·72 | S.W. | 3 | 3 | 3 | 3 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 1 | 1 | | | Range = 35°. | |
| | Min. | 29·606 | 29·613 | 76· | 75· | 67· | 67· | 60·0 | 63·0 | ·559 | ·578 | ·613 | ·591 | 9· | — | 77· | 65· | 68· | 63· | — | — | ·25 | ·25 | S.E. | 7 | 6 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | — | 1 | 1 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 3 | 7 | | | | |
| October | Max. | 30·034 | 30·016 | 89· | 90· | 78· | 80· | 77·1 | 75·0 | ·882 | ·854 | ·867 | ·865 | 116· | 68· | 92· | 74· | 84· | 71· | ·875 | 1·095 | 3· | 6·50 | N. | 1 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 8 | 9 | 9 | 9 | Max. = 92° on 3rd. | Total fall = 1·805 inch. |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 2 | 1 | | | Min. = 59° on 12th and 15th. | Max. in 24 hours = ·875 inch. on 5th. |
| | Mean | 29·866 | 29·824 | 74· | 75· | 68· | 68· | 66·0 | 67·6 | ·641 | ·636 | ·763 | ·740 | 93· | 62· | 78· | 65· | 75· | 62· | ·060 | ·070 | ·43 | ·70 | S.W. | 1 | 2 | 4 | 5 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 2 | 2 | | | Range = 33°. | |
| | Min. | 29·541 | 29·517 | 69· | 70· | 61· | 63· | 56·2 | 57·5 | ·461 | ·481 | ·565 | ·619 | 82· | 49· | 73· | 59· | 67· | 55· | ·035 | ·045 | ·25 | ·25 | S.E. | 4 | 5 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 8 | 6 | 1 | 1 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 4 | 4 | | | | |
| November | Max. | 29·934 | 29·900 | 71· | 74· | 68· | 70· | 67·0 | 68·0 | ·659 | ·681 | ·907 | ·907 | 100· | 61· | 77· | 67· | 74· | 63· | ·830 | ·850 | 6. | 3·25 | N. | 2 | 1 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 9 | 7 | 10 | 10 | Max. = 77° on 14th and 27th. | Total fall = 1·720 inch. |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 1 | 4 | | | Min. = 52° on 20th. | Max. in 24 hours = ·830 inch. on 4th. |
| | Mean | 29·750 | 29·694 | 66· | 67· | 62· | 62· | 59·3 | 60·1 | ·518 | ·533 | ·784 | ·781 | 82· | 54· | 70· | 60· | 68· | 57· | ·057 | ·061 | ·74 | ·80 | S.W. | 2 | 3 | 5 | 6 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | 6 | 5 | | | Range = 25°. | |
| | Min. | 29·505 | 29·470 | 58· | 59· | 53· | 54· | 48·1 | 49·1 | ·350 | ·362 | ·668 | ·668 | 71· | 42· | 61· | 52· | 59· | 46· | ·015 | ·015 | ·25 | ·25 | S.E. | 7 | 8 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | 1 | — | 2 | 2 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 2 | 2 | | | | |
| December | Max. | 29·916 | 29·882 | 68· | 69· | 63· | 65· | 60·2 | 61·6 | ·499 | ·570 | ·851 | ·853 | 93· | 59· | 75· | 64· | 70· | 60· | ·400 | ·450 | 8· | 5· | N. | 1 | — | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.W. | 12 | 9 | | | Max. = 75° on 1st. | Total fall = 1·690 inch. |
| | | | | | | | | | | | | | | | | | | | | | | | | W. | 5 | 12 | | | Min. = 47° on 30th. | Max. in 24 hours = ·400 inch. on 17th. |
| | Mean | 29·638 | 29·612 | 60· | 61· | 56· | 56· | 52·7 | 53·3 | ·415 | ·423 | ·766 | ·766 | 74· | 48· | 64· | 54· | 63· | 50· | ·054 | ·057 | 1·46 | 1·40 | S.W. | 8 | 7 | 6 | 6 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | S. | — | — | | | Range = 28°. | |
| | Min. | 29·204 | 29·229 | 50· | 52· | 46· | 47· | 38·0 | 40·2 | ·246 | ·283 | ·576 | ·632 | 65· | 39· | 55· | 47· | 50· | 42· | ·015 | ·015 | ·25 | ·25 | S.E. | 3 | 2 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | E. | — | — | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | N.E. | 1 | 1 | | | | |

No. 3.—TABLE showing the NATIVE POPULATION of MALTA for 1851, and the MORTALITY among the NATIVE POPULATION of the TOWN DISTRICTS for the Years 1859, 1860, and 1861.

| Towns | Valetta.* | | | Floriana. | | | Senglea. | | | Cospicua. | | | Vittoriosa. | | | Total. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Population, 1851 | Males - 11,983<br>Females - 11,644<br>Total - 23,627 | | | Males - 3,285<br>Females - 3,219<br>Total - 6,504 | | | Males - 2,760<br>Females - 3,192<br>Total - 5,952 | | | Males - 5,039<br>Females - 5,537<br>Total - 10,576 | | | Males - 2,622<br>Females - 2,888<br>Total - 5,510 | | | Males - 25,689<br>Females - 26,480<br>Total - 52,169 | | |
| Fatal Diseases. | M. | F. | Total. | M. | F. | Total | M. | F. | Total | M. | F. | Total. | M. | F. | Total | M. | F. | Total. |
| EPIDEMIC DISEASES, &c. | | | | | | | | | | | | | | | | | | |
| Nervous fever, Typhus | 35 | 22 | 57 | 7 | 12 | 19 | 3 | 8 | 11 | 20 | 11 | 31 | 7 | 7 | 14 | 72 | 60 | 132 |
| Small-pox | 68 | 69 | 137 | 1 | 4 | 5 | 3 | 1 | 4 | 27 | 22 | 49 | — | 1 | 1 | 99 | 97 | 196 |
| Whooping-cough | 11 | 11 | 22 | 3 | 5 | 8 | — | — | — | 3 | 2 | 5 | 6 | 4 | 10 | 23 | 22 | 45 |
| Croup | 6 | 12 | 18 | 4 | — | 4 | 4 | 3 | 7 | 7 | 1 | 8 | 5 | 5 | 10 | 26 | 21 | 47 |
| Measles | 20 | 20 | 40 | — | — | — | — | — | — | 4 | — | 4 | 2 | 1 | 3 | 26 | 21 | 47 |
| Scarlatina | — | 1 | 1 | — | — | — | 18 | 17 | 35 | 2 | 2 | 4 | — | — | — | 20 | 20 | 40 |
| SPORADIC DISEASES. | | | | | | | | | | | | | | | | | | |
| *Nervous System:—* | | | | | | | | | | | | | | | | | | |
| Cephalitis | 19 | 13 | 32 | 3 | — | 3 | — | 1 | 1 | 3 | 6 | 9 | 11 | 7 | 18 | 36 | 27 | 63 |
| Apoplexy | 35 | 42 | 77 | 5 | 10 | 15 | 10 | 12 | 22 | 8 | 24 | 32 | 5 | 8 | 13 | 63 | 96 | 159 |
| Myelitis | 1 | — | 1 | — | 1 | 1 | 2 | — | 2 | 1 | 1 | 2 | 1 | — | 1 | 5 | 2 | 7 |
| Paralysis | 1 | — | 1 | — | — | — | — | — | — | — | 1 | 1 | — | 3 | 3 | 1 | 4 | 5 |
| Convulsions | 57 | 49 | 106 | 9 | 7 | 16 | 2 | 8 | 10 | 4 | 5 | 9 | 7 | 5 | 12 | 79 | 74 | 153 |
| Tetanus | 3 | 2 | 5 | 1 | — | 1 | — | — | — | — | 1 | 1 | 1 | — | 1 | 5 | 3 | 8 |
| Hydrocephalus | 4 | 4 | 8 | — | — | — | 4 | 3 | 7 | — | — | — | — | — | — | 8 | 7 | 15 |
| Delirium tremens | 3 | — | 3 | — | — | — | — | — | — | — | — | — | — | — | — | 3 | — | 3 |
| *Respiratory Organs:—* | | | | | | | | | | | | | | | | | | |
| Laryngitis | 5 | 3 | 8 | — | 4 | 4 | 2 | 1 | 3 | — | — | — | 3 | 3 | 6 | 10 | 11 | 21 |
| Quinsey | 2 | 1 | 3 | — | — | — | 1 | 1 | 2 | 1 | — | 1 | — | — | — | 4 | 2 | 6 |
| Bronchitis | 25 | 27 | 52 | 2 | 3 | 5 | 3 | 2 | 5 | 17 | 15 | 32 | 5 | 9 | 14 | 52 | 56 | 108 |
| Pneumonia | 31 | 30 | 61 | 4 | 5 | 9 | 14 | 16 | 30 | 9 | 17 | 26 | 11 | 4 | 15 | 69 | 72 | 141 |
| Pleuritis | — | 1 | 1 | — | — | — | — | 1 | 1 | 1 | — | 1 | — | — | — | 1 | 2 | 3 |
| Asthma | 3 | 3 | 6 | 2 | — | 2 | — | — | — | 2 | — | 2 | — | — | — | 7 | 3 | 10 |
| Hydrothorax | 5 | 3 | 8 | 3 | 2 | 5 | 1 | 3 | 4 | 3 | 1 | 4 | 1 | 1 | 2 | 13 | 10 | 23 |
| *Circulation:—* | | | | | | | | | | | | | | | | | | |
| Cardiopathia | 28 | 18 | 46 | 3 | 3 | 6 | 1 | 8 | 9 | 2 | 5 | 7 | 3 | 5 | 8 | 37 | 39 | 76 |
| Palpitation | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Pericarditis, Hydro-P. | 12 | 4 | 16 | 3 | 1 | 4 | 2 | 2 | 4 | 4 | 3 | 7 | 1 | 2 | 3 | 22 | 12 | 34 |
| *Digestive Organs:—* | | | | | | | | | | | | | | | | | | |
| Teething | 132 | 149 | 281 | 39 | 47 | 86 | 32 | 31 | 63 | 151 | 97 | 248 | 37 | 26 | 63 | 391 | 350 | 741 |
| Cancrum oris | 1 | — | 1 | — | 1 | 1 | — | — | — | 1 | — | 1 | 1 | 1 | 2 | 3 | 2 | 5 |
| Gastritis, Enteritis | 40 | 46 | 86 | 12 | 13 | 25 | 11 | 17 | 28 | 62 | 40 | 102 | 27 | 25 | 52 | 152 | 141 | 293 |
| Peritonitis | — | 9 | 9 | — | — | — | — | 1 | 1 | — | 1 | 1 | — | — | — | — | 11 | 11 |
| Ascitis | — | 3 | 3 | — | — | — | 1 | 3 | 4 | 2 | 2 | 4 | 2 | 1 | 3 | 5 | 9 | 14 |
| Hernia | 2 | 3 | 5 | — | — | — | — | — | — | 1 | — | 1 | — | — | — | 3 | 3 | 6 |
| Ileus | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Hæmorrhoids | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| *Liver and Spleen:—* | | | | | | | | | | | | | | | | | | |
| Hepatopathia | 21 | 16 | 37 | — | — | — | 6 | 4 | 10 | 11 | 6 | 17 | 3 | 3 | 6 | 41 | 29 | 70 |
| Splenopathia | 1 | 2 | 3 | — | — | — | — | — | — | 2 | 1 | 3 | 2 | 3 | 5 | 5 | 6 | 11 |
| *Urinary Organs:—* | | | | | | | | | | | | | | | | | | |
| Nephritis | 1 | 1 | 2 | — | — | — | 1 | 1 | 2 | — | — | — | 1 | 1 | 2 | 3 | 3 | 6 |
| Cystitis | 3 | — | 3 | 1 | — | 1 | 1 | — | 1 | 3 | 1 | 4 | — | — | — | 8 | 1 | 9 |
| Stone | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Stricture, Ischuria | 2 | — | 2 | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | 2 |
| Diabetes | 1 | — | 1 | — | — | — | — | — | — | — | — | — | 1 | — | 1 | 2 | — | 2 |
| *Generative Organs:—* | | | | | | | | | | | | | | | | | | |
| Childbed | — | 4 | 4 | — | — | — | — | 2 | 2 | — | 7 | 7 | — | 2 | 2 | — | 15 | 15 |
| Metritis | — | 2 | 2 | — | 1 | 1 | — | 1 | 1 | — | 5 | 5 | — | — | — | — | 9 | 9 |
| Ovarian Dropsy | — | — | — | — | — | — | — | 1 | 1 | — | — | — | — | — | — | — | 1 | 1 |
| *Integumentary and Cellular:—* | | | | | | | | | | | | | | | | | | |
| Phlegmon, Abscess | — | — | — | — | — | — | — | 1 | 1 | — | 1 | 1 | — | 1 | 1 | — | 3 | 3 |
| Tumor | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Mortification | 2 | 1 | 3 | 1 | — | 1 | 1 | — | 1 | 1 | 1 | 2 | — | 1 | 1 | 5 | 3 | 8 |
| Anthrax | 5 | — | 5 | — | — | — | 1 | 2 | 3 | 3 | — | 3 | 1 | 2 | 3 | 10 | 4 | 14 |
| Erysipelas | 4 | 1 | 5 | 1 | 3 | 4 | — | — | — | 2 | — | 2 | 4 | 1 | 5 | 11 | 5 | 16 |
| *Constitutional:—* | | | | | | | | | | | | | | | | | | |
| Scrofula | 6 | 7 | 13 | — | — | — | — | — | — | — | — | — | — | — | — | 6 | 7 | 13 |
| Phthisis | 37 | 43 | 80 | 5 | 7 | 12 | 3 | 14 | 17 | 8 | 22 | 30 | 9 | 8 | 17 | 62 | 94 | 156 |
| Atrophy mesenterica | 24 | 28 | 52 | 28 | 17 | 45 | 9 | 13 | 22 | 10 | 7 | 17 | 19 | 15 | 34 | 90 | 80 | 170 |
| Cancer | 3 | 15 | 18 | 1 | — | 1 | — | 1 | 1 | 4 | 6 | 10 | 1 | 2 | 3 | 9 | 24 | 33 |
| *Hæmorrhages:—* | | | | | | | | | | | | | | | | | | |
| Hæmoptysis | 6 | 1 | 7 | — | — | — | — | — | — | — | — | — | 3 | — | 3 | 9 | 1 | 10 |
| Hæmatemesis | 4 | 1 | 5 | — | — | — | — | — | — | — | — | — | — | — | — | 4 | 1 | 5 |
| Metrorrhagia | — | 4 | 4 | — | 1 | 1 | — | 1 | 1 | — | 1 | 1 | — | 1 | 1 | — | 8 | 8 |
| Purpura hæmorrhagica | — | — | — | — | — | — | — | — | — | 1 | — | 1 | — | 1 | 1 | 1 | 1 | 2 |
| *Uncertain Seat:—* | | | | | | | | | | | | | | | | | | |
| Debility | 24 | 16 | 40 | 9 | 3 | 12 | 16 | 9 | 25 | 30 | 24 | 54 | 7 | 9 | 16 | 86 | 61 | 147 |
| Fever | 3 | 1 | 4 | 1 | — | 1 | — | — | — | 1 | — | 1 | — | — | — | 5 | 1 | 6 |
| Dropsy | 6 | 12 | 18 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 5 | 8 | 13 | 21 | 34 |
| Lightning | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| *Accidents or Violence:—* | | | | | | | | | | | | | | | | | | |
| Asphyxia | 6 | 11 | 17 | 2 | — | 2 | 4 | 5 | 9 | — | 1 | 1 | — | — | — | 12 | 17 | 29 |
| Drowning | 2 | — | 2 | — | — | — | — | — | — | 1 | — | 1 | — | — | — | 3 | — | 3 |
| Concussio | 3 | 1 | 4 | — | — | — | — | 1 | 1 | 1 | 1 | 2 | — | — | — | 4 | 3 | 7 |
| Vulnus | 1 | — | 1 | — | — | — | — | — | — | — | — | — | 1 | — | 1 | 2 | — | 2 |
| Ambustio | 2 | 1 | 3 | — | — | — | 1 | — | 1 | 1 | 1 | 2 | 1 | — | 1 | 5 | 2 | 7 |
| Old age, marasmus senilis | 7 | 9 | 16 | 3 | 1 | 4 | 3 | 5 | 8 | — | 7 | 7 | 2 | 1 | 3 | 15 | 23 | 38 |
| Unknown | — | — | — | 1 | 1 | 2 | — | — | — | — | — | — | 1 | — | 1 | 2 | 1 | 3 |

* 1859 Return for Valetta is for 10 months only.

## No. 4.

TABLE showing the CAUSES of MORTALITY among the POPULATION of 21 Country Districts containing 23,213 MALES, and 22,639 FEMALES in MALTA, and the TOTAL DEATHS for a Period of Three Years 1858, 1859, and 1860.

| Diseases. | Males. | Females. |
|---|---|---|
| ENDEMIC DISEASES, &c. | | |
| Nervous fever, Typhus | 41 | 50 |
| Small-pox | 67 | 63 |
| Whooping-cough | 35 | 34 |
| Croup | 20 | 15 |
| Measles | 26 | 35 |
| Chicken-pox | 1 | — |
| Scarlatina | 1 | 2 |
| SPORADIC DISEASES. | | |
| *Nervous System :—* | | |
| Cephalitis | 20 | 19 |
| Apoplexy | 108 | 90 |
| Paralysis | 1 | 1 |
| Convulsions | 201 | 126 |
| Tetanus (Trismus) | 26 | 10 |
| Hydrocephalus | 6 | 2 |
| *Respiratory Organs :—* | | |
| Laryngitis | 8 | 1 |
| Quinsey | 24 | 11 |
| Bronchitis | 77 | 73 |
| Pneumonia | 89 | 76 |
| Pleuritis | 6 | 6 |
| Asthma | 8 | 22 |
| Hydrothorax | 22 | 37 |
| *Organs of Circulation :—* | | |
| Cardiopathia | 10 | 17 |
| Palpittio | — | 1 |
| Pericarditis, Hydrop. Pericard. | 14 | 3 |
| *Digestive Organs :—* | | |
| Teething | 410 | 410 |
| Cancrum oris | — | 2 |
| Gastritis, Enteritis | 190 | 216 |
| Peritonitis | 5 | 6 |
| Ascites | 7 | 16 |
| Hernia | 4 | 3 |
| *Liver and Spleen :—* | | |
| Hepatopathia | 45 | 36 |
| Splenopathia | 25 | 31 |
| *Urinary Organs :—* | | |
| Nephritis | 1 | — |
| Cystitis | 4 | — |
| Stone | — | — |
| Stricture, Ischuria | 2 | 2 |
| Diabetes | 3 | 1 |
| *Organs of Generation :—* | | |
| Childbed | — | 15 |
| Metritis | — | 7 |
| *Integumentary and Cellular Systems :—* | | |
| Phlegmon, Abscess | 7 | 7 |
| Tumor | — | 1 |
| Mortification | 12 | 9 |
| Anthrax | 3 | 1 |
| Erysipelas | 8 | 4 |
| *Constitutional :—* | | |
| Scrofula | 11 | 7 |
| Phthisis | 31 | 40 |
| Atrophia mesenterica | 141 | 156 |
| Cancer | 9 | 9 |
| *Hæmorrhage :—* | | |
| Hæmoptysis | 1 | 4 |
| Hæmatemesis | 1 | — |
| Metrorrhagia | — | 8 |
| Purpura hæmorrhagica | 2 | — |
| *Uncertain Seat :—* | | |
| Debility | 114 | 84 |
| Fever | 2 | 3 |
| Petechial fever | 3 | 1 |
| Dropsy | 25 | 32 |
| Scurvy | — | 1 |
| *Accidental :—* | | |
| Asphyxia | 24 | 15 |
| Strangulation | — | 1 |
| Hanging | 1 | 1 |
| Suffocation | 2 | 1 |
| Drowning | 3 | 3 |
| Concussion | 5 | 3 |
| Ambustio | 1 | 2 |
| Vulnus | 7 | 3 |
| Old age and marasmus senilis | 26 | 43 |
| Unknown | — | 1 |

## No. 5.

POPULATION of MALTA and GOZO, according to the CENSUS taken on the 31st March 1851.

| | Males. | Females. | Total. |
|---|---|---|---|
| Population of Malta | 53,478 | 55,355 | 108,833 |
| Do. Gozo | 6,978 | 7,685 | 14,663 |
| Total | 60,456 | 63,040 | 123,496 |
| Population of Valetta | 12,670 | 12,131 | 24,801 |
| Do. Floriana | 3,388 | 3,317 | 6,705 |
| Do. Vittoriosa | 2,697 | 2,978 | 5,675 |
| Do. Cospicua | 5,113 | 5,592 | 10,705 |
| Do. Senglea | 2,884 | 3,276 | 6,160 |

N.B.—The Census of 1861 is in progress of abstraction.

No. 6.—General Table showing the Admissions and Deaths in the Central Civil Hospital, Floriana, during the Years 1859, 1860, and 1861.

| Disease. | Remaining on the 31st December 1858. | | | | | | | | | Admissions. | | | | | | | | | Deaths. | | | | | | | | | Total. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Natives. | | British. | | Foreigners. | | Total. | | | Natives. | | British. | | Foreigners. | | Total. | | | Natives. | | British. | | Foreigners. | | Total. | | | Under Treatment during the 3 Years. | Discharged. | Died. | Remaining on the 31st Dec. 1861. |
| | M. | F. | M. | F. | M. | F. | M. | F. | Total. | M. | F. | M. | F. | M. | F. | M. | F. | Total. | M. | F. | M. | F. | M. | F. | M. | F. | Total. | | | | |
| *Zymotic Diseases:—* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Variola | – | – | – | – | – | – | – | – | – | 11 | 6 | 2 | – | – | – | 13 | 6 | 19 | 1 | – | – | – | – | – | 1 | – | 1 | 19 | 13 | 1 | 5 |
| Morbilli | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 2 | – | 3 | – | 3 | 1 | – | – | – | – | – | 1 | – | 1 | 3 | 2 | 1 | – |
| Ophthalmia | 1 | – | – | – | – | 1 | – | 1 | 1 | 114 | 69 | 2 | – | 5 | – | 121 | 69 | 190 | – | – | – | – | – | – | – | – | – | 191 | 188 | – | 3 |
| Erysipelas | – | – | – | – | – | – | – | – | – | 1 | 5 | – | 1 | 1 | – | 2 | 6 | 8 | – | – | – | – | 1 | – | 1 | – | 1 | 8 | 7 | 1 | – |
| Dysenteria | – | – | – | – | – | – | – | – | – | 20 | 18 | 13 | – | 14 | – | 47 | 18 | 65 | 9 | 10 | 2 | – | 2 | – | 13 | 10 | 23 | 65 | 42 | 23 | – |
| Diarrhœa | – | 3 | – | – | – | – | 3 | 3 | 6 | 73 | 84 | 24 | 1 | 17 | – | 114 | 85 | 199 | 19 | 40 | 1 | – | 1 | – | 21 | 40 | 61 | 202 | 139 | 61 | 2 |
| Febris intermittens | – | – | – | – | – | – | – | – | – | 24 | 1 | 20 | – | 38 | – | 82 | 1 | 83 | 2 | – | – | – | – | – | 2 | – | 2 | 83 | 78 | 2 | 3 |
| Febris typhoides | – | – | – | – | – | – | – | – | – | 5 | 3 | – | 1 | 3 | – | 8 | 4 | 12 | 3 | – | – | – | 1 | – | 4 | – | 4 | 12 | 6 | 4 | 2 |
| Febris continua | – | – | – | – | – | – | – | – | – | 113 | 51 | 27 | 2 | 77 | – | 217 | 53 | 270 | 11 | 11 | 3 | – | 5 | – | 19 | 11 | 30 | 270 | 236 | 30 | 4 |
| Rheumatismus | 4 | 1 | – | – | – | – | 4 | 1 | 5 | 225 | 64 | 42 | – | 27 | 2 | 294 | 66 | 360 | 13 | 8 | 2 | – | 1 | 1 | 16 | 9 | 25 | 365 | 335 | 25 | 5 |
| Syphilis primaria | 2 | 1 | – | – | 1 | – | 3 | 1 | 4 | 76 | 96 | 38 | 2 | 38 | – | 152 | 98 | 250 | 1 | – | – | – | – | – | 1 | – | 1 | 254 | 247 | 1 | 6 |
| Syphilis secundaria | 1 | 1 | – | – | – | – | 1 | 1 | 2 | 43 | 31 | 19 | 4 | 8 | 2 | 70 | 37 | 107 | 1 | 2 | – | – | – | – | 1 | 2 | 3 | 109 | 103 | 3 | 3 |
| Gonorrhœa | – | 1 | – | – | – | – | – | 1 | 1 | 46 | 24 | 23 | 4 | 18 | – | 87 | 28 | 115 | – | – | – | – | – | – | – | – | – | 116 | 109 | – | 7 |
| Strictura urethræ | – | – | – | – | – | – | – | – | – | 41 | – | 1 | – | 1 | – | 43 | – | 43 | 2 | – | – | – | 1 | – | 3 | – | 3 | 43 | 40 | 3 | – |
| Purpura | – | – | – | – | – | – | – | – | – | 3 | 1 | – | – | – | – | 3 | 1 | 4 | – | – | – | – | – | – | – | – | – | 4 | 4 | – | – |
| Ebriositas | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Tenia solium | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Ascaris lumbricoides | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| *Constitutional Diseases:—* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dropsy | – | 3 | – | – | – | – | – | 3 | 3 | 58 | 63 | 7 | – | 5 | – | 70 | 63 | 133 | 29 | 41 | 1 | – | 2 | – | 32 | 41 | 73 | 136 | 61 | 73 | 2 |
| Cancer | – | – | – | – | – | – | – | – | – | 15 | 7 | 1 | – | – | – | 16 | 7 | 23 | 3 | 4 | – | – | – | – | 3 | 4 | 7 | 23 | 15 | 7 | 1 |
| Diabetes | – | – | – | – | – | – | – | – | – | 5 | – | – | – | – | – | 5 | – | 5 | 1 | – | – | – | – | – | 1 | – | 1 | 5 | 3 | 1 | 1 |
| Scrofula | 2 | 1 | – | – | – | – | 2 | 1 | 3 | 29 | 13 | – | – | 3 | – | 32 | 13 | 45 | 2 | 3 | – | – | – | – | 2 | 3 | 5 | 48 | 42 | 5 | 1 |
| Phthisis pulmonalis | – | – | – | – | – | – | – | – | – | 39 | 42 | 1 | 1 | 2 | – | 42 | 43 | 85 | 19 | 23 | – | 1 | 1 | – | 20 | 24 | 44 | 85 | 37 | 44 | 4 |
| Hæmoptysis | – | – | – | – | – | – | – | – | – | 7 | 1 | – | – | – | – | 7 | 1 | 8 | 3 | – | – | – | – | – | 3 | – | 3 | 8 | 5 | 3 | – |
| *Local Diseases:—* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meningitis | – | – | – | – | – | – | – | – | – | 1 | 3 | – | – | – | – | 1 | 3 | 4 | 1 | 2 | – | – | – | – | 1 | 2 | 3 | 4 | 1 | 3 | – |
| Apoplexia | – | – | – | – | – | – | – | – | – | 32 | 27 | 2 | – | 3 | – | 37 | 27 | 64 | 12 | 17 | – | – | – | – | 12 | 17 | 29 | 64 | 34 | 29 | 1 |
| Paralysis | 1 | – | – | – | – | – | – | – | – | 31 | 11 | 2 | – | 1 | – | 34 | 11 | 45 | 2 | 4 | – | – | – | – | 2 | 4 | 6 | 45 | 38 | 6 | 1 |
| Delirium tremens | – | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – | 1 | 1 | 2 | – | – | – | – | – | – | – | – | – | 2 | 2 | – | – |
| Convulsio | – | – | – | – | – | – | – | – | – | 2 | 2 | – | – | – | – | 2 | 2 | 4 | – | – | – | – | – | – | – | – | – | 4 | 4 | – | – |
| Neuralgia | – | – | – | – | – | – | – | – | – | 3 | 3 | 1 | – | – | – | 4 | 3 | 7 | – | – | – | – | – | – | – | – | – | 7 | 6 | – | 1 |
| Otitis | – | – | – | – | – | – | – | – | – | 4 | – | – | – | – | – | 4 | – | 4 | – | – | – | – | – | – | – | – | – | 4 | 4 | – | – |
| Fistula lachrymalis | – | – | – | – | – | – | – | – | – | 2 | – | – | – | 1 | – | 3 | – | 3 | – | – | – | – | – | – | – | – | – | 3 | 3 | – | – |
| Cataracta | – | – | – | – | – | – | – | – | – | 2 | 5 | – | – | – | – | 2 | 5 | 7 | – | – | – | – | – | – | – | – | – | 7 | 5 | – | 2 |
| Amaurosis | – | – | – | – | – | – | – | – | – | 5 | 2 | – | – | – | – | 5 | 2 | 7 | – | – | – | – | – | – | – | – | – | 7 | 7 | – | – |
| Pericarditis | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Aneurisma | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Varix | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Cardiopathia | 1 | – | – | – | – | 1 | – | 1 | 1 | 15 | 15 | 3 | 1 | 1 | 1 | 19 | 17 | 36 | 4 | 2 | – | – | – | – | 4 | 2 | 6 | 37 | 30 | 6 | 1 |
| Laryngitis | – | – | – | – | – | – | – | – | – | 16 | 4 | 3 | – | 3 | – | 22 | 4 | 26 | – | 1 | – | – | – | – | – | 1 | 1 | 26 | 25 | 1 | – |
| Bronchitis | 3 | 2 | – | – | – | 3 | 2 | 5 | 159 | 90 | 20 | 3 | 18 | – | 197 | 93 | 290 | 32 | 21 | 3 | 1 | 2 | – | 37 | 22 | 59 | 295 | 225 | 59 | 11 |
| Pleuritis | – | – | – | – | – | – | – | – | – | 7 | 5 | 1 | 1 | – | – | 9 | 6 | 15 | 2 | 1 | – | – | – | – | 2 | 1 | 3 | 15 | 12 | 3 | – |
| Pneumonia | 1 | – | – | – | – | 1 | – | 1 | 33 | 14 | 4 | – | 7 | – | 44 | 14 | 58 | 11 | 4 | 1 | – | 3 | – | 15 | 4 | 19 | 59 | 39 | 19 | 1 |
| Asthma | – | 1 | – | – | – | 1 | 1 | 7 | – | – | – | – | 1 | – | 8 | – | 8 | 1 | – | – | – | 1 | – | 2 | – | 2 | 9 | 7 | 2 | – |
| Asphyxia | – | – | – | – | – | – | – | – | – | 2 | – | – | – | 1 | – | 3 | – | 3 | – | – | – | – | – | – | – | – | – | 3 | 3 | – | – |
| Gastritis | 1 | – | – | – | – | 1 | – | 1 | 41 | 35 | 12 | – | 15 | – | 68 | 35 | 103 | 9 | 2 | – | – | 1 | – | 10 | 2 | 12 | 104 | 91 | 12 | 1 |
| Enteritis | – | – | – | – | – | – | – | – | 8 | 12 | – | – | – | – | 8 | 12 | 20 | 2 | 4 | – | – | – | – | 2 | 4 | 6 | 20 | 14 | 6 | – |
| Peritonitis | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Gastricismus | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Hernia | – | – | – | – | – | – | – | – | 11 | 3 | – | – | 3 | – | 14 | 3 | 17 | 3 | 1 | – | – | 2 | – | 5 | 1 | 6 | 17 | 11 | 6 | – |
| Hæmorrhois | – | – | – | – | – | – | – | – | 10 | – | – | – | 2 | – | 12 | – | 12 | – | – | – | – | – | – | – | – | – | – | 12 | 11 | – | 1 |
| Fistula in ano | 1 | – | – | – | – | 1 | – | 1 | – | 1 | – | – | – | – | – | 1 | 1 | – | – | – | – | – | – | – | – | – | – | 2 | 2 | – | – |
| Hepatitis | 2 | – | – | – | – | 2 | – | 2 | 45 | 18 | 6 | 1 | 11 | – | 62 | 19 | 81 | 16 | 6 | 1 | 1 | – | – | 17 | 7 | 24 | 83 | 55 | 24 | 4 |
| Splenitis | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | 1 | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Costipatio | – | – | – | – | – | – | – | – | 4 | – | – | – | 2 | – | 6 | – | 6 | 1 | – | – | – | – | – | 1 | – | 1 | 6 | 5 | 1 | – |
| Prolapsus recti | – | – | – | – | – | – | – | – | – | 2 | – | – | – | – | – | 2 | 2 | – | – | – | – | – | – | – | – | – | – | 2 | 2 | – | – |
| Nephritis | – | – | – | – | – | – | – | – | 2 | 3 | – | – | – | – | 2 | 3 | 5 | – | 1 | – | – | – | – | – | 1 | 1 | 5 | 3 | 1 | 1 |
| Cystitis | – | – | – | – | – | – | – | – | 3 | 1 | – | – | – | – | 3 | 1 | 4 | 1 | – | – | – | – | – | 1 | – | 1 | 4 | 2 | 1 | 1 |
| Calculus | – | – | – | – | – | – | – | – | 4 | 1 | – | – | – | – | 4 | 1 | 5 | 2 | – | – | – | – | – | 2 | – | 2 | 5 | 3 | 2 | – |
| Hydrocele | – | – | – | – | – | – | – | – | 5 | – | – | – | – | – | 5 | – | 5 | – | – | – | – | – | – | – | – | – | 5 | 5 | – | – |
| Orchitis | – | – | – | – | – | – | – | – | 16 | – | 3 | – | 5 | – | 24 | – | 24 | – | – | – | – | – | – | – | – | – | – | 24 | 24 | – | – |
| Metritis | – | 1 | – | – | – | – | 1 | 1 | – | 28 | – | – | – | – | – | 28 | 28 | – | 6 | – | – | – | – | – | 6 | 6 | 29 | 21 | 6 | 2 |
| Prolapsus uteri | – | – | – | – | – | – | – | – | – | 2 | – | – | – | – | – | 2 | 2 | – | – | – | – | – | – | – | – | – | – | 2 | 2 | – | – |
| Metrorrhagia | – | – | – | – | – | – | – | – | – | 2 | – | – | – | – | – | 2 | 2 | – | – | – | – | – | – | – | – | – | – | 2 | 2 | – | – |
| Arthritis | – | – | – | – | – | – | – | – | 1 | 1 | – | 1 | – | – | 1 | 2 | 3 | – | 1 | – | – | – | – | – | 1 | 1 | 3 | 2 | 1 | – |
| Psora | – | – | – | – | – | – | – | – | 24 | 52 | 2 | – | 2 | – | 28 | 52 | 80 | – | – | – | – | – | – | – | – | – | – | 80 | 80 | – | – |
| Herpes | – | – | – | – | – | – | – | – | 9 | 17 | 2 | – | 2 | – | 13 | 17 | 30 | – | 1 | – | – | – | – | – | 1 | 1 | 30 | 28 | 1 | 1 |
| Tinea | 1 | – | – | – | – | 1 | – | 1 | 20 | 6 | – | – | 1 | – | 21 | 6 | 27 | – | – | – | – | – | – | – | – | – | – | 28 | 28 | – | – |
| Phlegmon | 2 | – | 2 | – | – | 4 | – | 4 | 102 | 12 | 15 | 1 | 13 | – | 130 | 13 | 143 | 6 | 1 | 1 | – | 3 | – | 10 | 1 | 11 | 147 | 133 | 11 | 3 |
| Abscessus | – | – | – | – | – | – | – | – | 11 | 4 | – | – | 3 | – | 14 | 4 | 18 | 2 | 1 | – | – | – | – | 2 | 1 | 3 | 18 | 12 | 3 | 3 |
| Tumor | 1 | – | – | – | – | 1 | – | 1 | 30 | 6 | – | – | 5 | – | 35 | 6 | 41 | – | 2 | – | – | – | – | – | 2 | 2 | 42 | 39 | 2 | 1 |
| Carbunculus | – | – | – | – | – | – | – | – | 9 | 4 | – | – | – | – | 9 | 4 | 13 | – | – | – | – | – | – | – | – | – | 13 | 11 | – | 2 |
| Ulcus | – | 4 | – | – | – | – | 4 | 4 | 130 | 100 | 26 | 3 | 25 | – | 181 | 103 | 284 | 21 | 5 | – | – | – | – | 21 | 5 | 26 | 288 | 249 | 26 | 13 |
| Elephantiasis | – | – | – | – | – | – | – | – | – | 4 | – | – | – | – | – | 4 | 4 | – | 2 | – | – | – | – | – | 2 | 2 | 4 | 2 | 2 | – |
| Gangræna | – | – | – | – | – | – | – | – | 5 | 3 | – | – | 1 | – | 6 | 3 | 9 | 2 | 2 | – | – | 1 | – | 3 | 2 | 5 | 9 | – | 5 | 4 |
| Polypus nasi | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Hæmatemesis | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| *Developmental Diseases:—* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chlorosis | – | – | – | – | – | – | – | – | – | 3 | – | – | – | – | – | 3 | 3 | – | – | – | – | – | – | – | – | – | – | 3 | 2 | – | 1 |
| Paramenia | – | – | – | – | – | – | – | – | – | 3 | – | – | – | – | – | 3 | 3 | – | – | – | – | – | – | – | – | – | – | 3 | 2 | – | 1 |
| Debilitas infantilis | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Anemia | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| Senectus | – | – | – | – | – | – | – | – | 2 | 17 | – | – | – | – | 2 | 17 | 19 | – | 6 | – | – | – | – | – | 6 | 6 | 19 | 13 | 6 | – |
| Imperforatio ani | – | 1 | – | – | – | 1 | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| *Violence and Accidents:—* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ambustio | – | – | – | – | – | – | – | – | 3 | 3 | 3 | – | 2 | – | 8 | 3 | 11 | – | – | – | – | – | – | – | – | – | – | 11 | 10 | – | 1 |
| Contusio | – | – | – | – | – | – | – | – | 108 | 16 | 18 | – | 21 | – | 147 | 16 | 163 | 2 | – | – | – | – | – | 2 | – | 2 | 163 | 161 | 2 | – |
| Fractura | – | 1 | – | – | – | – | 1 | 1 | 65 | 23 | 10 | – | 11 | – | 86 | 23 | 109 | 6 | 2 | 1 | – | – | – | 7 | 2 | 9 | 110 | 94 | 9 | 7 |
| Vulnus | – | – | – | – | – | – | – | – | 104 | 6 | 21 | – | 14 | – | 139 | 6 | 145 | 5 | 1 | 1 | – | – | – | 6 | 1 | 7 | 145 | 136 | 7 | 2 |
| Vulnus sclopetarium | – | – | – | – | – | – | – | – | 10 | – | 1 | – | – | – | 10 | 1 | 11 | 1 | – | – | – | – | – | 1 | – | 1 | 11 | 9 | 1 | 1 |
| Luxatura | – | – | – | – | – | – | – | – | 4 | 3 | 1 | – | – | – | 5 | 3 | 8 | 1 | – | – | – | – | – | 1 | – | 1 | 8 | 7 | 1 | – |
| Concussio | – | – | – | – | – | – | – | – | 12 | – | – | – | 1 | – | 13 | – | 13 | 3 | – | – | – | – | – | 3 | – | 3 | 13 | 9 | 3 | 1 |
| Tetanus | – | – | – | – | – | – | – | – | 5 | – | – | – | – | – | 5 | – | 5 | 4 | – | – | – | – | – | 4 | – | 4 | 5 | 1 | 4 | – |
| Pregnans | – | 2 | – | – | – | – | 2 | 2 | – | 67 | – | 1 | – | – | – | 68 | 68 | – | 2 | – | – | – | – | – | 2 | 2 | 70 | 64 | 2 | 4 |
| Puerperium | – | – | – | – | – | – | – | – | – | 5 | – | – | – | – | – | 5 | 5 | – | – | – | – | – | – | – | – | – | 5 | 5 | – | – |
| Under observation | – | – | – | – | – | – | – | – | 20 | 39 | 22 | 5 | 8 | – | 50 | 44 | 94 | – | – | – | – | – | – | – | – | – | 94 | 94 | – | – |
| Parents with their children | – | 1 | – | – | – | 1 | 1 | 1 | 18 | – | – | – | – | – | 1 | 18 | 19 | – | – | – | – | – | – | – | – | – | 20 | 18 | – | 2 |
| Children with their parents | – | 2 | – | – | – | 2 | 2 | – | 79 | – | – | – | – | – | – | 79 | 79 | – | – | – | – | – | – | – | – | – | 81 | 81 | – | – |
| Total | | | | | | 26 | 26 | 52 | | | | | | | | 2963 | 1389 | 4352 | | | | | | | 317 | 244 | 561 | 4,404 | 3720 | 561 | 123 |

Dr. L. Pisani, Superintendent. D. G. Desalvo, Physician. Dr. G. L. Engerer, Surgeon.

No. 7.

Office of Land Revenue and Public Works,
SIR, Valetta, 17th July 1861.

I HAVE the honour to transmit for the information of His Excellency the Governor, the following returns:—

Return of works in progress for the month of June last.

Return of the public tanks in Valetta, Floriana, and the three cities.

Return of public fountains.

Return of the tanks in barracks and other public establishments.

Return of the public tanks in the country.

Prior to the preparation of the four last-mentioned returns, I thought it proper to direct the two senior guardians of the aqueducts, upon whose operations, owing to their long experience in the service, the Government might rely with confidence, to make a general survey of the two aqueducts, to measure the quantity of water flowing from the different sources, to state the manner in which that water is distributed, and to verify the capacity and contents of all the public tanks, and at the same time to give an approximate estimate of the capacity of the tanks in private houses within the cities.

By their report, which I have also the honour to transmit, it will be seen that the sources of the Wignancourt aqueduct are 10 in number, giving together at this moment 373½ gallons of water per minute, which, in winter time, increases in relation to the quantity of rain.

The flow of water from that quantity to the public fountains and other reservoirs in the country, is at the present time 99½ gallons per minute, equal to 568½ tons per 24 hours.

The water constantly flowing into the public fountains at Floriana, the officers' quarters, barracks, Capuchin convent, public gardens, civil hospital, Ospigio, as detailed in the said report, is now 27¼ per minute, equal to 155¾ tons for 24 hours.

The water constantly running into the public fountains of Valetta, into the nunneries, to Messrs. Woodhouse's stores, to the military hospitals, and to St. Elmo barracks, is 34 gallons per minute, equal to 194¼ tons for 24 hours.

By the said report it will also be seen that there are 35 direct communications with the aqueduct, using water *ad libitum*, the consumption of which, by an estimate made, amounts to 89 gallons per minute.

The remaining quantities, out of the total of the spring aqueduct, 124 gallons per minute, is distributed into the public tanks, and in tanks of private houses and gardens, and from which water is also supplied to men of war, steamers, and other shipping.

The aqueduct which conveys water into the towns of Cospicua, Vittoriosa and Senglea, called the "Fauara Aqueduct," derives its water from the following springs, which, having been measured, have been found to give—

| | Gallons per minute. |
|---|---|
| The spring at St. Giorgio - | 31½ |
| „ „ Annunziata - | 16 |
| | 47½ |
| To which is to be added the spring lately acquired, "Tal Fauara," (the deed of the transfer of which has been signed to-day) | 16½ |
| Total - | 64 |

The quantity of water required to keep in an efficient state the public fountains in these cities, amounting to 27 gallons per minute, equal to 154¼ tons per 24 hours, there would remain a balance (when the new spring is added) of 37 gallons per minute, or 211 tons for 24 hours, which would enable this department to fill up the several public cisterns and the new naval tank at Corradino, within the space of four months.

The number of public tanks in Valetta, Floriana, Cospicua, Senglea and Vittoriosa, is 122; their total capacity is—

| | Tons. |
|---|---|
| | 118,721 |
| The number of tanks in the public institutions, barracks, and other military and public buildings, is 152; capable of containing - - - - | 102,666 |

The number of tanks in private houses in the four cities and Floriana is 4,294, which, at the minimum rate of 300 tons each, might be capable of holding 1,288,200, but may be considered at present to contain only one third of that quantity.

The number of public tanks in the country is 123; their capacity, having been carefully measured, amounts to 28,926 tons:—the water they hold is 18,008, not including the small quantity existing in the tanks recently constructed at Sliema, and St. Julian's, the capacity of which is 7,428 tons; these will be emptied ere long, to prepare them against next autumn for the reception of water.

In concluding, I venture to submit for the consideration of His Excellency the Governor, the expediency of adopting the following measures, necessary, in my opinion, for filling up with the least possible delay, the public tanks, and the tanks in the civil and military establishments.

1st. That all permanent pittances of water, with the exception of those to public fountains and reservoirs, be stopped.

2nd. That all direct communications with the aqueduct by which water is taken *ad libitum*, be removed.

3rd. That all civil and military establishments should draw water from their cisterns by pumps, conveying the same to iron or wooden tanks, to be placed on an elevated position of the building, from which it might be distributed by pipes to any locality, in the same manner as has been lately done in the New Lunatic Asylum.

4th. That the works included in the estimates which I have the honour to forward herewith may be executed without loss of time.

I have, &c.
(Signed) G. VELLA,
Collector.

---

RETURN of CISTERNS in PUBLIC DEPARTMENTS in VALETTA, FLORIANA, and the THREE CITIES showing their Capacity and the Water existing in them on the 30th June 1861.

| Where situated. | Capacity. | | Contents. | |
|---|---|---|---|---|
| VALETTA. | Feet. | Tons. | Feet. | Tons. |
| Fort St. Elmo (Upper) - | 31 0 | 1,628·88 | 31 0 | 1,628·88 |
| Do. do. - | 23 0 | 757·63 | 4 0 | 126 |
| Do. do. - | 26 0 | 887·188 | 4 0 | 126 |
| Do. do. - | 16 0 | 147 | 1 6 | 15 |
| Do. (Lower) - | 28 6 | 8,322·8 | 17 6 | 4,900 |
| Do. do. - | 16 6 | 180 | 2 6 | 100 |
| General Hospital - | 35 6 | 1,277·24 | 27 8 | 1,032 |
| Do. - - | 35 6 | 1,160 | 2 4 | 100 |
| Do. - - | 14 0 | 68·160 | 2 0 | 9 |
| Do. - - | 14 0 | 68·168 | 2 6 | 10 |
| Do. - - | 25 0 | 73·36 | 6 8 | 20 |
| Strada Torre barracks - | 27 6 | 800 | 12 5 | 390 |
| St. James' Cavalier barracks - - - | 35 6 | 878 | 9 4 | 220 |
| Commissariat Bakery - | 30 0 | 915·20 | 20 0 | 550 |
| Do. - - | 16 0 | 622·60 | 16 0 | 622·60 |
| Do. - - | 26 0 | 557·70 | 3 2 | 62 |
| Do. - - | 16 0 | 105·28 | 4 0 | 26 |
| Do. - - | 10 0 | 32* | | |

* Blocked up for the convenience of the Commissariat Department.

| Where situated. | Capacity. | | Contents. | |
|---|---|---|---|---|
| | Feet. | Tons. | Feet. | Tons. |
| Auberge de Castile - | 30 0 | 1,088 | 21 9 | 730 |
| Do. - - | 17 0 | 500 | 14 0 | 430 |
| Do. - - | 17 0 | 300 | 9 0 | 140 |
| Auberge di Bavaria - | 30 0 | 1,090 | 13 0 | 530 |
| Do. d'Italia - - | 32 0 | 1,628 | 12 0 | 790 |
| Do. de France - | 29 0 | 1,088·109 | 7 0 | 280 |
| Do. do. - - | 20 0 | 130 | 6 0 | 30 |
| Do. do. - - | 26 0 | 130 | 5 0 | 30 |
| Do. do. - - | 18 0 | 100 | 10 0 | 55 |
| Do. do. - - | 14 0 | 203 | 8 6 | 110 |
| Do. de Provence - | 19 0 | 300 | 1 0 | 15 |
| Do. do. - | 18 0 | 1,000 | 2 8 | 170 |
| The Court - - - | 18 0 | 87 | 18 0 | 87 |
| Do. - - - | 16 0 | 89 | 2 4 | 12 |
| Do. - - - | 26 0 | 800 | 16 0 | 480 |
| Do. - - - | 14 0 | 132 | 1 0 | 10 |
| Orphan Asylum - - | 11 0 | 200 | 8 0 | 165 |
| Hospital of Incurables - | 27 0 | 926 | 5 6 | 210 |
| Do. - - | 7 0 | 36·160 | — | Empty.* |
| Do. - | 18 0 | 200 | 5 0 | 60 |
| Military Store Department | 24 0 | 198 | 18 6 | 150 |
| Do. - | 32 0 | 500 | 15 6 | 250 |
| Workshop at St. Mezzodi | 15 6 | 120 | 15 6 | 120 |
| Do. - | 15 0 | 85 | 15 0 | 85 |
| Do. - | 13 0 | 190 | 2 6 | 65 |
| Communication to Ditch St. John's - - | 26 0 | 587·190 | 24 0 | 520 |
| Communication to St. Michael - - - | 11 0 | 45 | 6 9 | 30 |
| Lower Flank St. Andrew | 12 0 | 68 | 1 5 | 12 |
| Do. - | 11 0 | 18 | 3 3 | 6 |
| Do. - | 14 0 | 72 | 14 0 | 72 |
| Old Prison - - - | 34 0 | 397·15 | 9 4 | 100 |
| Do. - - - | 24 0 | 203·44 | 2 9 | 30 |
| Public Library - - | 22 6 | 631·125 | 7 5 | 170 |
| Do. - - | 8 6 | 97 | 2 4 | 30 |
| The Palace - - - | 38 0 | 900 | 21 8 | 470 |
| Do. - - - | 24 0 | 640 | 7 4 | 220 |
| Do. - - - | 26 0 | 540 | 11 0 | 240 |
| Do. - - - | 18 0 | 893 | 1 6 | 90 |
| Porta Reale Ditch - | 20 0 | 191·101 | 4 0 | 50 |
| Do. - - | 17 0 | 132·54 | 4 0 | 35 |
| Do. - - | 13 0 | 162·113 | 2 10 | 40 |
| Do. - - | 12 0 | 73·32 | — | Empty.* |
| Strada San Marco Barracks - - - | 19 0 | 194 | 19 0 | 194 |
| Carpenter's Shop, Strada Fianca - - - | 18 0 | 147 | 6 6 | 55 |
| Lascaris Barracks - - | 26 0 | 1,842 | 5 6 | 370 |
| Do. - - | 25 0 | 1,011 | 3 9 | 130 |
| FLORIANA. | | | | |
| Poor House - - - | 28 6 | 282·30 | 18 6 | 180 |
| Do. - - - | 24 6 | 719·64 | 24 6 | 719·64 |
| Do. - - - | 17 6 | 683·112 | 17 6 | 683·112 |
| Do. - - - | 10 6 | 176·82 | 9 6 | 160 |
| Do. - - - | 17 6 | 71·28 | 10 0 | 40 |
| Do. - - - | 17 6 | 188·20 | 7 4 | 100 |
| Do. - - - | 14 0 | 68 | 14 0 | 68 |
| Do. - - - | 20 0 | 73 | 14 0 | 50 |
| Do. - - - | 19 0 | 73 | — | Empty.* |
| Do. - - - | 14 0 | 56 | 5 9 | 18 |
| Piazza Militare Barracks | 22 0 | 878 | 12 6 | 440 |
| Mad House - - - | 15 0 | 600 | 15 0 | 600 |
| Do. - - - | 22 0 | 680 | 3 0 | 90 |
| Do. - - - | 13 0 | 24 | 10 0 | 20 |
| Do. - - - | 13 0 | 60 | 11 0 | 50 |
| Do. - - - | 20 0 | 400 | 2 0 | 40 |
| Do. - - - | 13 0 | 68 | 1 0 | 5 |
| Do. - - - | 14 0 | 73 | 3 0 | 30 |
| Do. - - - | 18 0 | 450 | — | Empty.* |
| Argotti Gardens - - | 18 0 | 1,600 | 12 6 | 1,000 |
| Do. - - | 11 0 | 785 | 5 0 | 392 |
| Do. - - | 15 0 | 73 | 3 0 | 15 |
| Do. - - | 15 0 | 68 | 10 0 | 50 |
| St. Francis Barracks - | 26 0 | 205 | 1 6 | 10 |
| Do. Ravelin - | 6 0 | 14 | 6 0 | 14 |
| Notre Dame Gate - - | 4 0 | 28 | 3 0 | 20 |
| Do. - - | 18 0 | 153 | 18 0 | 153 |
| Notre Dame Ditch - | 16 0 | 73 | 8 0 | 37 |
| Do. - - | 17 0 | 68 | 3 7 | 12 |
| Corradino - - - | 28 6 | 7,568 | 26 0 | 7,400 |

* Out of repair.

| Where situated. | Capacity. | | Contents. | |
|---|---|---|---|---|
| | Feet. | Tons. | Feet. | Tons. |
| SENGLEA. | | | | |
| Isola Point Battery - | 34 0 | 800 | 6 0 | 133 |
| Isola, Field Officers' Quarters - - - - | 16 0 | 500 | 10 0 | 340 |
| Isola, Officers' Quarters - | 18 0 | 140 | 5 0 | 50 |
| Do. - | 24 0 | 640 | 2 0 | 54 |
| COSPICUA. | | | | |
| St. Elena, No. 1. - - | 28 6 | 7,870 | 25 5 | 6,970 |
| Do. No. 2 - - | 28 6 | 312 | 25 5 | 9,900 |
| St. Francis Barracks - | 18 0 | 11,190 | 2 9 | 35 |
| Do. Ditch - - | 16 0 | 40 | 2 3 | 2 |
| Do. do. - | 14 0 | 72 | — | Empty.† |
| VITTORIOSA. | | | | |
| Inquisitor's Palace - | 26 0 | 430 | 9 8 | 190 |
| Do. - - | 14 0 | 100 | 2 4 | 12 |
| Do. - - | 14 0 | 72 | 9 2 | 50 |
| Do. - - | 14 0 | 68 | — | Empty.† |
| Cotonera Hospital - | 30 0 | 500 | 13 6 | 200 |
| Do. - - | 14 0 | 68 | 7 0 | 28 |
| Do. - - | 15 0 | 120 | 15 0 | 120 |
| Cotonera, St. Salvador Fort - - - | 22 0 | 800 | 1 9 | 60 |
| Cotonera, St. Salvador Ditch - - - | 20 0 | 484 | — | Empty.† |
| Do. - - - | 19 0 | 270 | 4 6 | 54 |
| Do. - - - | 17 0 | 595 | 11 9 | 430 |
| Do. - - - | 10 0 | 15 | 10 0 | 14 |
| Do. - - - | 22 0 | 854 | 5 11 | 220 |
| Do. - - - | 20 0 | 855 | 1 9 | 70 |
| Do. Zabbar Gate - | 19 0 | 68 | 2 1 | 10 |
| Do. - - - | 18 0 | 173* | — | — |
| Do. - - - | 14 0 | 76 | 9 5 | 50 |
| Do. - - - | 14 0 | 556 | 0 8 | 20 |
| Do. - - - | 19 0 | 470 | 18 0 | 460 |
| Do. - - - | 16 0 | 200 | 12 6 | 150 |
| Do. - - - | 24 0 | 3,000 | 9 9 | 1,130 |
| Do. - - - | 14 0 | 73 | 3 9 | 25 |
| Do. - - - | 26 0 | 1,600 | 19 6 | 1,200 |
| Fort St. Angelo - - | 30 0 | 800 | 6 8 | 180 |
| Do. - - | 22 0 | 630 | 1 2 | 25 |
| Do. - - | 22 0 | 500 | 4 7 | 100 |
| Do. - - | 10 0 | 73 | 0 8 | 5 |
| Do. - - | 22 0 | 147 | — | Empty.† |
| Do. - - | 22 0 | 700 | 2 0 | 63 |
| Do. - - | 11 0 | 83 | — | Empty.† |
| Do. - - | 16 0 | 68 | 2 6 | 8 |
| Fort Ricasoli - - | 26 0 | 1,156 | 10 0 | 550 |
| Do. - - | 17 0 | 450 | 0 10 | 20 |
| Do. - - | 13 0 | 68 | 0 9 | 5 |
| Do. - - | 14 0 | 73 | 5 3 | 26 |
| Do. - - | 28 0 | 800 | 0 3 | Empty.† |
| Do. - - | 28 0 | 700 | 3 10 | 90 |
| Do. - - | 28 0 | 800 | 1 0 | 25 |
| Do. - - | 32 0 | 500 | 0 8 | 8 |
| Do. - - | 20 0 | 365 | 0 8 | 8 |
| Do. - - | 18 0 | 365 | — | Empty.† |
| Fort Verdala - - | 30 0 | 3,333 | 10 8 | 1,111 |
| Do. - - | 30 0 | 833 | — | Empty.† |
| Do. - - | 9 0 | 25 | 5 4 | 15 |
| Do. - - | 18 0 | 600 | — | Empty.† |
| Do. - - | 24 0 | 666 | 2 0 | 50 |
| Do. - - | 20 0 | 800 | 9 10 | 800 |
| Do. - - | 5 0 | 14 | — | Empty.† |
| Do. - - | 14 0 | 147 | 1 10 | 10 |
| | — | 102,746·176 | — | 55,176·176 |

* Destroyed by the military. † Out of repair.

NOTE.—The tanks in this statement within barracks and military departments are to be repaired by the engineer department.

(Signed) G. VELLA, Coll.

RETURN of PUBLIC TANKS in the Country.

| Where situated. | Number of Tanks. | Capacity. | Quantity of Water existing. |
|---|---|---|---|
| | | Tons. | Tons. |
| Notabile | 5 | running water | — |
| Casal Dingli | 1 | ditto | — |
| „ Birchirchara | 7 | 3,491 | 3,000 |
| „ Lia | 4 | 500 | 400 |
| „ Balzan | 2 | 1,277 | 1,060 |
| „ Zeitun | 11 | 4,169 | 4,070 |
| „ Attard | 2 | 446 | 400 |
| „ Siggieni | 7 | 1,339 | 980 |
| „ Zabbar | 8 | 600 | 540 |
| „ Musta | 3 | 624 | 530 |
| „ Zebbug | 8 | 1,400 | 900 |
| „ Nasciaro | 13 | 560 | 440 |
| „ Micabiba | 1 | 798 | 798 |
| „ Ditto | 1 | running water | — |
| „ Gargur | 11 | 740 | 650 |
| „ Gudia | 4 | 250 | 200 |
| „ Chircop | 1 | 2,268 | 2,000 |
| „ Ditto | 2 | running water | — |
| „ Safi | 1 | 240 | 240 |
| „ Creudi | 4 | 793 | 480 |
| „ Luca | 2 | 400 | 200 |
| „ Zurrico | 6 | 233 | 180 |
| „ Curmi | 2 | 400 | 240 |
| „ Ditto | 1 | running water | — |
| „ Tarxien | 3 | 260 | 200 |
| „ Asciak | 4 | 390 | 300 |
| Melleha and St. Paul's Bay | 3 | 320 | 200 |
| Ditto | 1 | running water | — |
| Sliema | 2 | 6,340 | — |
| St. Julian's | 3 | 1,088 | — |
| Total | 123 | 28,926 | 18,008 |

(Signed) G. VELLA, Collector.

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In adempimento dell' incarrico datoci dal collettore delle Rendite Territoriale di misurare la quantità di acqua che scorre dalle sorgenti dell' Acquedotto Wignancourt e dell Acquedotto Fauara e la loro distribuzione in fontane pubbliche ed in altri locali nelle Quattro Città e nella campagna conferiti nei diversi locali suddetti, passiamo a relatare.

Che le seguenti sono le sorgenti che somministrano l'acqua all' Acquedotto Wingnancourt, e che la quantita che scorre da ciascuna, secondo un' esatta misura da noi presa il 28 Luglio scorso, e come siegue,—

| | Gall. per min. |
|---|---|
| Sorgente di Ghain Kajet | 168 |
| „ „ Busugrilla | 59½ |
| „ „ Hofret Irriz | 36 |
| „ „ Ghariescem | 14 |
| „ „ Iccianti | 12 |
| „ „ Biepirrua | 16½ |
| „ „ Ghain Cliep | 9½ |
| „ „ Wied Lemu | 9 |
| „ „ Boschetto | 47½ |
| „ „ Gnieu Fierez | 1½ |
| Totale | 373½ |

Che da questa quantità sono alimentate le seguenti fontane pubbliche e recipienti :—

*Nella Campagna :—*

| | Gall. per. min. |
|---|---|
| Fontana in Casal Zebbug | 3½ |
| Do. do. Attard | 1½ |
| Do. do. Lia | 2 |
| Do. do. Vallone Birchircara | 4 |
| Do. do. Via San Guiseppe | 5½ |
| Do. do. do. (Vicino Blacas) | 6½ |
| Fontana nella Pietà | 1½ |
| Do. do. Misida | 2 |
| Do. do. do. | 2 |
| Recipienti in Beni del Governo | 67 |
| Do. nella Marsa, cioè, nei due Macelli, nell Fornace, nella Conseria | 4 |
| Totale | 99½ |

*Nella Floriana :—*

| | Gall. per min. |
|---|---|
| Fontana nella Piazza St. Anna | 5 |
| Do. do. Sarria | 3½ |
| Officers' Quarters | 1¼ |
| Convento dei Cappucini | 4½ |
| Giardino Bottanico | 2 |
| Do. D'Argotti | ¼ |
| Notre Dame Gate | ½ |
| Ospedale Centrale pel lavatojo | 1 |
| Floriana Barracks | 2¼ |
| Ospigio | 7 |
| Totale | 27¼ |

*Nella Valetta :—*

| | Gall. per min. |
|---|---|
| Fontana vicino Porta Reale | 2 |
| Due Fontane sulla Piazza Sn. Giovanni | 1½ |
| Fontana nella piccola Piazza Sn. Giovanni | 1½ |
| Do. Strada Sta. Ursala | 1½ |
| Due Fontane in Piazza S. Giorgio | 8 |
| Fontana in Strada Fontana | 1½ |

| | Gal. per min. |
|---|---|
| Fontana in Sta. Cristoforo | 1½ |
| Do. nel Manderaggio | 2½ |
| Do. do. | 3½ |
| Do. do. Porta Marina | 2 |
| Recipiente Molo Marina | 1½ |
| Do. Porta Calcara | ½ |
| Do. Porta Nuova | ½ |
| Monastero Sta. Ursala | ½ |
| Do. Santa Catarina | ½ |
| Casa del Sigr. Woodhouse | 2 |
| Ospedale Militare e quartiere St. Elmo (indipendentemente della provista alle cisterne) | 3 |
| Totale | 34 |

Che le seguenti communicazioni essendo direttamento coll' Acquedotto il consumo del acqua sta in arbitrio ed a discrezione dei proprietarj ed occupanti dei seguenti fondi :—

*Nella Campagna :—*

Torre Hofrit Irriz (3 communicazioni.)
Do. Icciianti 5 do.
Giardino Corogna.
Do. Ghain Cliep.
Do. Guien Fierez.
Do. Guien Issultan.
Do. Busugrilla.
Do. Ghariescem.
Torre Bukana.
Molino in Birchircara.
Torre Boschetto (2 communicazioni).

*Nella Marsa Floriana & Valetta* :—

Fabbrico del gas.
Rivellino Santo Francesco.
Casa del Governo, occupata dal Signor Le Mesurier.
Ospedale Centrale (oltre un gallone per minuto che scorre pel' Lavatojo).
Scuola Militare Piazza Brettanica.
Do. Infantile Piazza Sarria.
Casa Sda. Reale No. 7, di proprietà del Barone Azzopardi.
Farmacia di Governo (Valetta).
Scuola di Governo di femmine.
Casa Sda. Mercanti No. 210, di proprietà di Governo detenuta a censo dal Signor Salvo Gatt.
Bottega Sottoposta, Sda. Mercanti No. 204.
Bottega Strada Teatro No. 135, detenuta da Antonio Zard.
Caffè de la Reine.
Casa di Governo, occupata dal Signor Cleugh.
Palazzo di Governo.
Orfanatrofio.
Ospedale degli Incurabili.

Da calcolo fatto il consumo delle sopradette communicazioni è di 89 galloni per minuto.

L'Acquedotto della Fauara che somministra acqua alle 3 città e Corradino si alimenta dalle seguenti sorgenti :—

| | Gall. per min. |
|---|---|
| Sorgente in San Giorgio | 31½ |
| Do. Annunziata | 16 |
| Do. della Fauara | 16½ |
| Totale | 64 |

Quest' ultima sorgente non è ancora amressa essenda stata da recente acquistata.

Le prime due sorgenti danno 47½ galloni per minuto, le quali alimentano le seguenti fontane :—

| | Gall. per min. |
|---|---|
| Fontana in Casal Paola | 1 |
| Due Fontane nella Vittoriosa | 4½ |
| Cinque do. nella Cospicua | 9¾ |
| Fontana nella Calcara | 2 |
| Due do. Senglia | 6¾ |
| Gebietta Pubblicha in C. Luca | 3 |
| Totale | 27 |

In adesione delle istruzioni avute abbiamo ancora verificato la capacità e l' acqua esistente nelle seguenti cisterne e gebie, delle quali il seguente é un prospetto :—

| | |
|---|---|
| Nelle Quattro Città e Floriana No. 122 cisterne pubbliche della capacità di | 118,963 |
| 152 do nei pubblici stabilimenti e quartieri e fortezze, cioè :— | |
| No. 63 nella Valetta | |
| „ 29 „ Floriana | |
| „ 4 „ Senglia | |
| „ 5 „ Cospicua | |
| „ 22 Vittoriosa e Cotonera | 102,666 |
| „ 8 nell Forte St. Angelo | |
| „ 10 „ Ricasoli | |
| „ 8 „ Verdala | |
| „ 3 Cotonera Nell' Ospedale | |
| „ 2 Caserne Lascaris | |

La quantità di acqua nelle sopradette 274 cisterne ascende a ton. 130,085.

Da un calcolo approsimativo della capacità delle seguenti cisterne in case private (non avendo potuto misurare con precisione per mancanza di tempo) siamo di opinione che 300 tonnellate ad un coacerro si potrebbe calcolare il minimum della loro capacità, cioè :—

| | | | |
|---|---|---|---|
| No. 1,281 | cisterne | nella Valetta | 364,300 |
| 288 | do. | Floriana | 86,400 |
| 910 | do. | Senglia | 273,030 |
| 977 | do. | Cospicua | 293,100 |
| 838 | do. | Vittoriosa | 251,400 |
| Totale | | | 1,489,859 |

La quantità di acqua nelle sopradette cisterne esistenti in case private potrebbe ad un dipresso considerarsi ad un terzo delle loro capacità ; per fare una misura positiva si richiederebbe il temo di circa 4 mesi.

Le cisterne pubbliche nella campagna ascendono a No. 123, cioè :—

| | |
|---|---|
| Notabile | 5 |
| Dingli | 1 |
| Birchircara | 7 |
| Lia | 4 |
| Balzan | 2 |
| Zeitun | 11 |
| Attard | 2 |
| Siggieni | 7 |
| Zabbar | 8 |
| Musta | 3 |
| Zebbug | 8 |
| Naxaro | 13 |
| Micabba | 2 |
| Gargur | 11 |
| Gudia | 4 |
| | 88 |
| Chircop | 3 |
| Safi | 1 |
| Crendi | 4 |
| Luca | 2 |
| Zurrico | 6 |
| Curmi | 3 |
| Tarxien | 3 |
| Asciak | 4 |
| Melleha & San Paolo | 4 |
| Sliema | 2 |
| San Giuliano | 3 |
| Totale | 123 |

La loro capacità ascende a 28,926 tonnellate, e l' acqua che in questo momento contengono a 18,008 ton. ; le gebie di recente scavate nella Sliema e S. Giuliano, della capacità insieme di 7,428 tonnellate, sono intieramente vuote pocchissima acqua essendovi introdotta in esse dal tempo della loro costruzione che ebbe fine negli ultimi mesi dell' inverno scorso.

In fine sulla domanda a noi fatta circa il tempo richiesto per empire dall' Acquedotto tutte le cisterne delle 4 Città e Floriana, e nostra opinione che quattro mesi di tempo sarebbe necessario, quale però si potrebbe diminuire ad una metà restringendo il consumo di acqua nei quartieri e publichi stabilimenti e togliendo le communicazioni dirette che esistono coll' Acquedotto.

Dobbiamo soggiungere che il recente nettamento di diversi canali ed il loro rialtamento hanno accrescuito il volume di acqua che scorre nella linea dell' Acquedotto.

Ufficio delle Rendite Territoriale,
e dei Lavori Publici,
Valetta, 12 Luglio, 1861.

(Firmato) Salvatore Borg.
(Firmato) Felice Borg.

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Estimate of the expenses required for effecting the works here-under specified in the public aqueducts.

*Fauara Aqueduct.*

| | £ | s. | d. |
|---|---|---|---|
| Communicating the spring just acquired at the Fauara with the main duct, by laying down 200 feet of channels, and constructing a small reservoir - - - - - - | 12 | 0 | 0 |
| Communicating the public tanks at Cospicua, Senglea, and Vittoriosa, with the main line which crosses those towns, by laying down 9,972 feet of 2-inch iron pipes - - - - | 649 | 13 | 0 |

*Wignancourt Aqueduct.*

| | £ | s. | d. |
|---|---|---|---|
| Making a communication from the reservoir in Porta Reale to Strada Fianco, 368 feet in length - - - | 34 | 11 | 4 |
| Repairing the communication of Marina Fountain - - - - - | 10 | 0 | 0 |
| Continuing to the extent of 230 feet, the communication to Piazza Fosse, Floriana - - - - - | 26 | 0 | 0 |
| Making a communication from the Officer's quarters, at Floriana, to Strada Mercanto - - - - - | 9 | 10 | 0 |
| | £741 | 4 | 4 |

Office of Land Revenue and Public Works,
Valetta, 17th July 1861.
(Signed) E. N. Galizia,
Head Surveyor.

Seen.
(Signed) G. Vella, Collector.

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No. 8.

Provisions relating to the Public Health contained in the "Laws and Regulations of Police for the Island of Malta and its Dependencies."

The following Acts and omissions are prohibited:

1. To throw or to let fall any dirt, rags, or other matters, in a street or over a street, or to let offensive or stinking materials flow towards a street; or to transport such materials through a street otherwise than in vehicles or by other covered means; or to beat or shake dust from carpets, or mats, or other objects, in a street or over a street, except by permission of the police; or to void urine in any street of the cities of Valetta, Cospicua, Senglea, and Vittoriosa, or of the suburb called Floriana, except in the places appointed for that purpose; or to deposit or leave in a street filth, or rubbish that may have fallen in the conveyance of the same; or to deposit on the wall of any enclosure contiguous to a street stones which ought not to be laid or deposited therein.

51. It is prohibited to construct chimneys, ovens, or forges, against a partition wall, although a person's own property, between tenements belonging to different proprietors, or to establish or keep in the neighbourhood of the property of others workshops from which there might be danger of fire, or of explosion, or of noxious exhalations, without a licence from the police, in which shall be specified the distances and works requisite to prevent damage being caused either to a neighbour or to the public health. The differences, however, between the respective proprietors or neighbours on such matters, so far as regards property, shall continue to be cognizable by the Civil Courts.

53. In every house or other building the proprietor shall construct a suitable sink communicating, if it be possible, with the main sewer or with some other outlet according to rule; and every occupier of a house or other building shall reveal to the police the want of such sink.

54. The proprietor of every house or other building is bound to maintain the sink with the requisite drains and coverings, and with a proper grating affixed to the mouth of each drain, in a good state of repair, and shall repair the sink within such reasonable time as shall be fixed in a notice from the police calling on him to do so.

55. Over every cistern, well, or ditch, which is intended to be kept open in any house, building, or other place, the proprietor shall keep constantly and in good repair a fence at least three palms in height.

56. It is prohibited to leave dirty, corrupt, or stagnant water in undergound or other places, whether within houses or elsewhere, so as to produce injury to the public health, or annoyance to the neighbourhood; and every person shall take care that, through his negligence, the contents of any sink, or any drain for water or filth, shall not run over or ooze out to the prejudice or annoyance of the occupiers of a con tiguous tenement.

57. Whenever it shall be signified or reported to the police that a collection of manure or other noxious or offensive matter exists in any building or other place, to the prejudice of the public health or annoyance of the neighbourhood, the police shall immediately give notice to the proprietor of such manure or other matter, or to the occupier of the place where it may exist, that it must be removed within twenty-four hours after such notice.

58. Whenever any house or other building shall be in such a dirty or unwholesome state as to prejudice the public health, or when the whitewashing, cleaning, or purification of any house or other building may tend to prevent any infectious, contagious, or epidemic sickness which might occur therein, it shall be lawful for the police to order the proprietor or occupier of such house or other building, to whitewash, clean, or purify the tenement in such manner and within such time as may be thought reasonable by the police.

60. No person shall keep slaughter-houses or pigsties in any place or exercise any art or trade which may be prejudicial to the public health or safety, or may annoy the neighbours; and no person shall keep in any place merchandise which may produce noxious vapours or odours, or which may be prejudicial to the public health or safety.

61. If the annoyance or injury contemplated in the preceding article be not stopped within such period as shall have been prescribed by the Court, the contravener shall be liable, besides the penalty for the contravention, to a penalty not exceeding two pounds sterling for every day during which such annoyance or injury shall continue unremedied after the expiration of the prescribed period.

64. It is prohibited to burn, boil, distil, or otherwise decompose any root, drug, or other thing, in houses, buildings, or other places, causing thereby offensive or dangerous odours or vapours, so as to be prejudicial to the public health or an annoyance to the neighbourhood, without a licence from the police, as prescribed in article 51.

67. No cemetery shall be made at a distance less than two hundred yards from any inhabited house, unless with the consent in writing of the proprietor, or of the tenant or other occupier of such house; and although the prescribed distance be observed, yet, if any prejudice to the public health or annoyance to the neighbourhood could result, the distance shall be increased according to the opinion of competent persons.

72. It is prohibited to bury corpses without the permission of the police.

73. It is prohibited to exhume corpses, or to open any tomb, before one year shall have elapsed since the burial of a corpse therein, without the permission of the police.

74. Except in cases of absolute necessity, the police shall not issue the permission for the burial of corpses before twenty-four hours shall have elapsed since death took place.

75. It is prohibited to bury corpses in any cemetery situate in any place in which the police shall have prohibited burials, and without making use of those sanitary precautions which may be prescribed by the police.

78. The head of the Civil Government is empowered to make regulations in all matters respecting the extent, position, and formation of cemeteries, the manner of burying corpses, and the general police of such places.

81. It is the duty of every person to whom the officer indicated in article 80 may have provided water, to assure himself, that the cistern in which the water is to be contained, and the conduits or tubes through which it must pass be not broken or damaged in any such way that the water supplied may be in any quantity wasted.

82. Every person shall avoid causing, by his negligence, the opening, breaking, or damaging of any lock, earthen pipe, tube, door, or other appurtenance of any reservoir, or other receptacle of public water, or the waste of such water in any other manner.

83. Every person shall avoid causing, by his negligence, any manure, mud, or other noxious or offensive things to be introduced into the fountains, aqueducts, or other places destined for the preservation of the public water; or putrid waters or other offensive matters to percolate into them from sewers, drains, or other places; or the public water to be in any other way rendered foul or unwholesome.

84. It is prohibited to wash animals, clothes, or other things in, or to let animals drink from, fountains in which it is not specially permitted so to do, or to bathe or wash in any fountain or other receptacle destined for the preservation of public waters, or for a public water-course.

86. Every keeper of a slaughter-house shall maintain the same in a wholesome state, and remove the filth therefrom at least once in every twenty-four hours.

87. The head of the Civil Government is empowered to make regulations in regard to the grant of licences, and the registry and inspection of slaughter-houses.

89. It is prohibited within the limits of the cities of Valetta, Vittoriosa, Cospicua, and Senglea, to slaughter or cause to be slaughtered any animals of the kinds mentioned in the said tariff, in any other place than the slaughter-houses, without a licence from the police.

91. No person shall neglect to cause to be interred beyond the limits of any inhabited place, within twenty-four hours, the carcase of any animal belonging to the same, which might otherwise cause prejudice to the public health or annoyance to the neighbourhood.

92. The head of the Civil Government is empowered to make regulations for the purpose of prohibiting, ordering, or regulating the removal from one place to another of animals, meat, skins, horns, or other parts of animals, or of straw, hay, or other articles, which might probably infect the atmosphere and cause the spread of contagious disease; for the purpose of purifying the stalls, or other places in which animals may be kept; for the object of arranging the way in which animals which may die in a state of sickness should be disposed of; and also for the purpose of ordering that the appearance of any disease amongst animals be reported.

95. It shall be lawful for any person to destroy any dog or other animal which may be found in the street, and may be reasonably suspected of being attacked with hydrophobia, or of having been bitten by a dog or other animal reasonably suspected of being attacked with hydrophobia.

110. It is prohibited to expose for sale any meat or fish which may be unfit for human food.

111. Any officer of police is empowered to enter into any place kept or used for the preservation or sale of meat or fish, and to search whether there exists therein any meat or fish unfit for human food; and if any be found therein it is competent to the Court to order the same to be destroyed or to be disposed of in any other way, so as to prevent its being used for human food.

112. Every shopkeeper shall keep in a clean and wholesome state both the interior of the shop and the external space around the shop, within reasonable limit to be fixed by the police.

115. It shall be lawful for the head of the Civil Government to make regulations for the better discovery of any fraudulent practices, and for the preservation of good order and cleanliness in the markets.

116. It is prohibited to exercise the trade of baker, maker of bread, or miller, without a licence from the police.

165. It is prohibited to leave in the ports or on the moles any merchandise or other rotten or unwholesome thing which might be prejudicial to the public health, or give rise to a nuisance.

210. No passage boat shall, without a permit from the officer appointed by the said superintendent, approach any vessel before she be admitted to pratique.

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## No. 9.

### Ordinance No. 11 of 1855.

An Ordinance enacted by the Governor of Malta, with the advice and consent of the Council of Government thereof,

To facilitate the practice of vaccination and to make the same compulsory in certain cases.

Whereas it is expedient to facilitate the practice of vaccination and to make the same compulsory in certain cases, it is hereby enacted and ordained by his Excellency the Governor, with the advice and consent of the Council of Government, as follows :— Preamble.

1. As soon as possible after the promulgation of this Ordinance, the Head of the Civil Government shall appoint one or more physicians or surgeons for each of the cities of Valetta, Cospicua, Vittoriosa, and Senglea, and their suburbs, for each of the country districts of Malta, and for the islands of Gozo and Comino, to vaccinate such children as shall be brought to them, and such other persons as shall of their own accord present themselves to be vaccinated. Physicians or Surgeons to be appointed to vaccinate.

2. The Superintendent of Police shall from time to time publish a notice indicating the places, days, and hours, in which for the period of four months from the date of the publication of such list one or more of the physicians or surgeons aforesaid shall be in attendance for the object indicated in the preceding section. Notices to be issued.

One or more of the physicians or surgeons aforesaid shall respectively attend in each of the places which shall be indicated in the manner aforesaid, at least once in each week of every month within the period aforesaid, and shall each time remain in attendance at least four hours. Attendance of Physicians or Surgeons in appointed places.

3. The father of every child, which at the date of the promulgation of this Ordinance has not attained nine full years of age and has not been vaccinated, When children are to be vaccinated.

shall within four months from the publication of the first notice which shall be issued after the promulgation of this Ordinance present such child, in one of the places and on one of the days indicated in such notice, to the physician or surgeon in attendance, in order that the said child may be vaccinated, and shall moreover bring the said child to the said physician or surgeon on the day appointed by the same in order that he may observe the result of the vaccination.

In cases, however, where any child has not attained three full months of age, the aforesaid period shall commence to run from the day of the publication of the first notice issued after the day on which the said child shall have attained three full months of age.

All children hereafter born to be vaccinated.

4. The father of every child who shall be born after the promulgation of this Ordinance shall present, in the manner aforesaid, such child for the purposes above indicated, within four months from the date of the publication of the first notice issued after three months from the date of the birth of such child.

Certificate if a child is not in a fit state for vaccination. When the child is to be presented again.

5. If the physician or surgeon aforesaid is of opinion that any child presented to him is not in a fit state to be successfully vaccinated, he shall deliver to the person who presented the child a certificate containing such opinion; and the father of the child shall again present the child within four months from the publication of the first notice following.

Certificate of vaccination.

6. If the vaccination shall have been successful the physician or surgeon aforesaid shall deliver to the person who presented the child a certificate of such vaccination, and if the vaccination shall not have taken good effect, the father of the child shall again present the said child for the purposes indicated in section 3, at such time as shall be pointed out to him by the physician or surgeon.

Certificate that a child is insusceptible.

Moreover, in cases where the physician or surgeon is of opinion that a child is insusceptible of vaccination, he shall give to the person who presented the child a certificate of such opinion, and it shall no longer be necessary to present such child for vaccination.

Cases of children vaccinated, but not by appointed Physician or Surgeon.

7. A father, who shall have caused his child to be successfully vaccinated by a physician or surgeon other than those appointed by the Head of the Civil Government according to the provision of section 1, shall obtain from such physician or surgeon a certificate of the vaccination and of the success of the same, and shall deliver such certificate to the Superintendent of Police, or to the Syndic or the Inspector of Police of the place of his residence, within the period within which, in the absence of such vaccination, he would have been bound to present the child for vaccination.

Failing father duties posed mothe others

8. In case of the absence, death, or incapacity of the father of the child, the duties imposed by this Ordinance on the father shall be performed by the mother or by such other person as may have the care of the child.

Penalt

9. Any contravention against any of the provisions of this Ordinance committed by the father, or in the case contemplated in section 8, by the mother or other person having the care of the child, shall subject the contravener to an *ammenda*, not exceeding twenty shillings sterling, recoverable by civil process on the demand of any officer of executive Police before a Court of Judicial Police of the island in which the contravener resides, or, in the case of a person residing in a country district of Malta, before the Court of the Syndic of such district.

Excep as to ties.

If the contravener should allege some just cause or excuse to the satisfaction of the Court, it shall be lawful for the Court to remit the fine, and to give to the contravener such admonition as the Court may consider requisite.

No fee lowed.

10. It shall not be lawful for the physicians or surgeons, appointed as aforesaid by the Head of the Civil Government, to receive any remuneration from any person, who at the hours and places appointed for the vaccinations shall present any child for such purpose, without any distinction of class or of place of residence of such person.

Passed the Council of Government at — Sitting No. 5. 15th March 1855.

R. C. Legh,
Clerk to the Council.

Assented to this day, 17th March 1855,
Palace Valetta.

(L.S.) Wm. Reid,
Governor.

By command,
Henry Lushington,
Chief Secretary to Government.

No. 10.

Return of Vaccination, showing the Number of Children successfully vaccinated in Malta and Gozo, from 14th March to 6th July 1861.

| Districts. | By Police Physicians. | By Medical Practitioners. | Total. |
|---|---|---|---|
| **Malta.** | | | |
| Valetta and Floriana | 645 | 359 | 1,004 |
| Senglea, Cospicua, and Vittoriosa | 1,089 | 910 | 1,999 |
| 1st District | 495 | 264 | 759 |
| 2nd ,, | 386 | — | 386 |
| 3rd ,, | 704 | 100 | 804 |
| 4th ,, | 700 | 30 | 730 |
| 5th ,, | 683 | 28 | 711 |
| 6th ,, | 203 | 5 | 208 |
| 7th ,, | 438 | 20 | 458 |
| Total | 5,343 | 1,716 | 7,059 |
| **Gozo.** | | | |
| District of Rabato | 208 | 4 | 212 |
| ,, Nadur | 139 | — | 139 |
| Total | 347 | 4 | 351 |
| Grand Total, Malta and Gozo | 5,690 | 1,720 | 7,410 |

Police Office, Valetta, 14th October 1861.
D. Ghio, Chief Police Physician.

No. 11.

RETURN of CHILDREN who have died of SMALL-POX in MALTA and GOZO, from 26th January (first Case) up to this Day.

| Districts. | Jan. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|
| Birchircara - - - | 1 | 8 | 8 | 20 | 10 | 3 | – | – | – | 50 |
| Cospicua - - - | – | 2 | – | 1 | 1 | 2 | 5 | | – | 14 |
| Notabile - - - | – | – | 1 | – | – | 1 | 2 | | – | 4 |
| Balzan - - - | – | – | – | 4 | 1 | 2 | 3 | 3 | – | 13 |
| Senglea - - - | – | – | – | 1 | – | – | – | – | – | 1 |
| Curmi - - - | – | – | – | 1 | – | – | – | – | – | 1 |
| Zabbar - - - | – | – | – | – | 1 | 1 | 1 | – | – | 3 |
| Valetta - - - | – | – | – | – | 2 | 1 | 9 | 19 | 25 | 56 |
| Nazaro - - - | – | – | – | – | 2 | 1 | 4 | – | – | 7 |
| Floriana - - - | – | – | – | – | – | 1 | – | – | – | 1 |
| Rabato of Gozo - - - | – | – | – | – | – | – | – | 1 | – | 1 |
| Total - - - | 1 | 10 | 9 | 27 | 17 | 12 | 24 | 26 | 25 | 151 |

Population, Malta - - - 123,401
„ Gozo - - - - 16,441
139,842

Police Office, Valetta, October 15, 1861,
D. GHIO, Chief Police Physician.

No. 12.

GOVERNMENT NOTICE.

With a view to the better provision of accommodation for the poorer working classes, and the obvious importance to be attached to constructing such dwellings on the best principles, for securing convenience of domestic arrangement, economy of space and rent, coupled with good drainage and ventilation; his Excellency the Governor is pleased hereby to signify, that the Government are prepared to receive plans and designs from all persons who may wish to submit them for such class of buildings.

His Excellency is further pleased to direct that two premiums, the first of 25*l.* and the second of 10*l.*, be allotted for the two designs declared by a Board, to be specially appointed for their examination, to be the most eligible for the purpose contemplated, and the highest in point of merit.

The dimensions of the site to be allotted for such buildings are 158 feet by 131, with three frontages.

A plan of the same can be seen on application at the Chief Secretary's Office.

The designs to be sent in to the Chief Secretary on or before the 30th November next.

By command,
WILFORD BRETT,
Acting Chief Secretary to Government.

Palace, Valetta,
October 2, 1858.

No. 13.

Department of Land Revenue and Public Works,
Valetta, 18th October 1861.

His Excellency the Governor having, with a view of continuing the execution of the scheme referred to in the Government Notice of the 2nd of October 1858, for the construction of dwellings for the use of the poorer classes, been pleased to direct that a large portion of the building at Floriana, called "Franconi," be granted on a perpetual lease, on the condition that two dwelling houses, separated by streets, be built upon it, in accordance with a plan which may be seen in this office, or in accordance with such other plan as may receive His Excellency's approbation; notice is hereby given that sealed tenders will be received at this office until 12 o'clock on Saturday, the 30th of November next, from persons desirous of obtaining the grant of the aforesaid lease.

Tenders will be received either for one only, or for both, of the sites destined for the said dwelling houses.

No tender will be considered as accepted, until the acceptance thereof has been communicated to the party tendering, by a letter from the undersigned.

The principal conditions of the contract may be known on application at this office.

A deposit of 25*l.* is required with each tender.

G. VELLA, Collector.

No. 14.

ORDINANCE No. XIV. of 1859.

An Ordinance enacted by the Governor of Malta, with the advice and consent of the Council and Government thereof,

For the better discovery of certain adulterations of drinks or food destined for being sold or issued in the island of Malta and its Dependencies, and for preventing the sale or issue of certain adulterated food or drinks.

Preamble. Whereas it is expedient to adopt more effectual measures for the discovery of certain adulterations of drinks or food destined for being sold or issued in the island of Malta and its dependencies, and to prevent the sale or issue of certain adulterated food or drinks, it is hereby enacted and ordained by his Excellency the Governor, with the advice and consent of the Council of Government, as follows:

Police to seize drinks or food for ascertaining whether they are injurious to health. Article 1. It shall be lawful for the police to enter any shop, magazine, or other place in which drinks or food may be exposed for being sold or issued in the island of Malta and its Dependencies, or may be kept in deposit to be there or in any other place and at any time, sold or issued in the said islands, and to seize such drinks or food in order to cause them to be examined or analyzed, for the purpose of ascertaining whether they are adulterated in such manner as to be, from the mixture therein contained, injurious to health.

Mode of proceeding in such cases. 2. In every case of seizure of drinks or food, made by virtue of the provision contained in the preceding article, the police shall summon the person from whose possession such articles shall have been seized, to appear before the Court of Judicial Police, and show cause why such articles should not be subjected to the examination or to the analysis aforesaid; and the Court, if it shall be of opinion that the seizure was made agreeably to the provision of the preceding article, shall order the said articles to be, according to their nature, examined or analyzed by competent persons to be by the said Court appointed as *periti*.

Appointment of periti. 3. Three *periti* shall be appointed in cases where, regard being had to the nature of the articles seized and to the circumstances of the case, the Court, shall

not consider it to be sufficient to appoint one individual only.

The examination or the analysis shall be made upon all articles seized, or upon a portion of them, as the *periti* shall deem it necessary.

In cases where three *periti* are appointed, if they be not unanimous the Court shall adopt the opinion of the majority.

4. The persons appointed as aforesaid, shall make to the above-mentioned Court a report in writing, which shall be read in the presence of the person from whose possession the things examined or analyzed shall have been seized; and if from such report, to be confirmed on oath, it shall result that the drinks or foods seized are adulterated so as to be, from the mixture therein contained, injurious to health, the Court shall sentence the person from whose possession such articles shall have been seized, to pay all judicial costs, including the fee due to the persons who made the examination or the analysis; and shall order all the said articles to be forfeited. If, on the contrary, it shall result that such articles are not adulterated, or that they are not injurious to health, the Government shall make good any damage, which by the examination or by the analysis aforesaid may have been caused to the articles seized or to any portion thereof.

5. The provisions of this Ordinance do not supersede any other provisions of the law, with respect to the punishments awarded against the persons who may have sold or issued adulterated drinks or food, or with respect to the manner of proving the adulteration of such articles, or with respect to other matters, whenever the case may fall under such other provisions.

Passed the Council of Government at Sitting No. 74 June 10, 1859.

G. B. Trapani, Clerk to the Council.

Assented to this 23rd day of July 1859.

J. Gaspard Le Marchant, Governor.

(L.S.) By command,

Wilford Brett,
Acting Chief Secretary to Government.

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Extract from the Criminal Laws for the Island of Malta and its Dependencies.

Article 234. "Whosoever shall knowingly sell or "issue any adulterated drinks or food, which from "the mixture therein contained are prejudicial to "health, shall be punished with imprisonment from "seven months to one year.

"In cases of small importance, the punishment of "multa or of ammenda shall be awarded.

"In all cases the drinks and the food shall be "forfeited."

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Multa (fine), its maximum is 20*l.*, and its minimum 5*l.* In default of payment, the multa is converted into imprisonment for a term not exceeding one day for every 10*s.*, such imprisonment in no case to exceed one month.

Ammenda (fine), its maximum is 5*l.*, and its minimum no less than 2*s.* 6*d.* In default of payment the ammenda is converted into detention for a term not exceeding one day for every 2*s.* 6*d.*, such detention in no case to exceed one month.

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No. 15.—Malta.—Table showing the Groups of Diseases by which the Sickness and Mortality among the Troops have been caused in the Two Periods (1837–46, and 1859) respectively.

| | 1859.—Strength 5,310. | | | | | | 1837–46. Average Annual Strength 2,117. | |
|---|---|---|---|---|---|---|---|---|
| | Admitted into Hospital. | Deaths in Malta. | Deaths of Invalids. | Total died. | Annual ratio per 1,000 of Strength. | | Annual ratio per 1,000 of Strength. | |
| | | | | | Admitted. | Died. | Admitted. | Died. |
| I. | | | | | | | | |
| 1. Miasmatic diseases | 2,996 | 59 | – | 59 | 564·2 | 11·11 | 497·7 | 6·80 |
| 2. Enthetic | 797 | – | – | – | 150·1 | – | 98·8 | – |
| 3. Dietic | 14 | – | – | – | 2·6 | – | ·05 | ·05 |
| 4. Parasitic | 60 | – | – | – | 11·3 | – | 3·6 | – |
| II. | | | | | | | | |
| 1. Diathetic | 12 | – | – | – | 2·3 | – | 2·4 | ·09 |
| 2. Tubercular | 78 | 9 | 3 | 12 | 14·7 | 2·26 | 13·9 | 6·38 |
| III. | | | | | | | | |
| Diseases of the— | | | | | | | | |
| 1. Nervous system | 107 | 6 | 1 | 7 | 20·2 | 1·32 | 15·4 | ·85 |
| 2. Circulatory „ | 52 | 4 | 1 | 5 | 9·8 | ·94 | 4·3 | ·42 |
| 3. Respiratory „ | 488 | 9 | – | 9 | 91·9 | 1·69 | 131·1 | 1·65 |
| 4. Digestive „ | 296 | 1 | – | 1 | 55·7 | ·19 | 101·65 | 1·23 |
| 5. Urinary „ | 6 | 1 | – | 1 | 1·1 | ·19 | 1·1 | – |
| 6. Reproductive „ | 6 | – | – | – | 1·1 | – | ·8 | – |
| 7. Locomotive „ | 7 | – | – | – | 1·3 | – | 1·4 | – |
| 8. Integumentary „ | 1,081 | – | – | – | 203·6 | – | 135·6 | ·14 |
| IV. | | | | | | | | |
| 4. Diseases of Nutrition | 2 | – | – | – | ·4 | – | ·1 | ·05 |
| V. | | | | | | | | |
| 1. Accidents | 427 | 7 | – | 7 | 80·4 | 1·32 | 99·7 | 1·51 |
| 3. Homicide | – | – | – | – | – | – | – | – |
| 4. Suicide | – | – | – | – | – | – | – | ·19 |
| 5. Execution | – | – | – | – | – | – | – | – |
| 6. Corporal punishment | 20 | – | – | – | 3·8 | – | 10·7 | – |
| Diseases not stated | 28 | – | – | – | 5·3 | – | 2·1 | – |
| Total | 6,477 | 96 | 5 | 101 | 1,219·8 | 19·02 | 1,119·9 | 19·36 |

No. 16.

MALTA.—TABLE showing the Ratio of Admissions and Deaths from Miasmatic Diseases among the Troops during Two Periods.

| — | 1859. | 1837–46. |
|---|---|---|
| Annual ratio of Admissions per 1,000 - - - | 564·2 | 497·7 |
| „ Deaths „ - - - | 11·11 | 6·80 |

No. 17.

MALTA.—TABLE showing the Nature of the Miasmatic Diseases and their comparative Prevalence among the Troops during the same Two Periods.

| — | 1859. | | Annual ratio per 1,000. | | | |
|---|---|---|---|---|---|---|
| | | | 1859. | | 1837–46. | |
| | Admitted. | Died. | Admitted. | Died. | Admitted. | Died. |
| Eruptive Fevers - - - - | 2 | – | ·4 | – | 1·6 | ·05 |
| Paroxysmal „ - - - - | 59 | – | 11·1 | – | 2·8 | ·28 |
| Continued „ - - - - | 1,431 | 47 | 269·5 | 8·85 | 207·3 | 1·46 |
| Dysentery, Diarrhœa, &c. - - | 811 | 10 | 152·7 | 1·88 | 150·5 | 2·41 |
| Sore Throat - - - - | 79 | – | 14·9 | – | 17·1 | – |
| Ophthalmia - - - - | 308 | – | 58· | – | 65·9 | – |
| Rheumatism - - - | 293 | 2 | 52·2 | ·38 | 42·7 | ·09 |

No. 18.

MEDICAL STATISTICS of the GARRISON, MALTA, 10 years, from 1st April 1849 to 31st March 1859.

Total aggregate strength for the period, non-commissioned officers and men, British troops 33,810; native troops, 5,686.

| Diseases. | British Troops. Total Numbers. | | Native Troops. Total Numbers. | |
|---|---|---|---|---|
| | Admitted. | Died. | Admitted. | Died. |
| Fevers, intermittent - - - - | 82 | 2 | 5 | — |
| „ remittent - - - - | 643 | 5 | — | — |
| „ yellow - - - - - | 2 | 1 | — | — |
| „ C. continued - - - - | 7,954 | 78 | 265 | 2 |
| „ Typhus - - - - | 9 | 4 | 3 | 2 |
| „ eruptive - - - - | 78 | 3 | 6 | — |
| Cholera - - - - - | 298 | 163 | 20 | 13 |
| Diarrhœa - - - - - | 3,203 | 14 | 325 | 1 |
| Dysentery - - - - - | 580 | 31 | 9 | 2 |
| Hepatic diseases - - - - | 344 | 11 | 15 | 1 |
| Rheumatism - - - - - | 1,301 | 4 | 251 | — |
| Phthisis - - - - - - | 201 | 67 | 14 | 7 |
| Other Pulmonary diseases - - - | 2,755 | 38 | 254 | 4 |
| All other diseases - - - - | 20,685 | 67 | 2,424 | 9 |
| Total - - - - | 38,135 | 488 | 3,591 | 41 |

Dated this 11th day of February 1861.

JN. FORREST, M.D.
Inspector-General of Hospitals, P.M.O.

No. 19.

RETURN of ADMISSIONS into the MILITARY HOSPITALS, MALTA, from April 1855 to March 31st, 1860.

| Year. | Months. Disease. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Strength. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1855-56 | Fevers - - | 13 | 20 | 39 | 143 | 55 | 177 | 31 | 39 | 36 | 15 | 26 | 19 | |
| | Other diseases | 134 | 144 | 184 | 179 | 150 | 296 | 294 | 236 | 165 | 139 | 121 | 124 | 1,741 |
| | Total - | 147 | 164 | 223 | 322 | 205 | 473 | 325 | 275 | 201 | 154 | 147 | 143 | — |
| 1856-57 | Fevers - - | 22 | 36 | 339 | 661 | 432 | 401 | 153 | 45 | 36 | 26 | 45 | 50 | |
| | Other diseases | 107 | 198 | 400 | 688 | 831 | 760 | 720 | 600 | 496 | 508 | 390 | 535 | 7,239 |
| | Total - | 129 | 234 | 739 | 1,349 | 1,263 | 1,161 | 873 | 645 | 532 | 534 | 435 | 585 | — |
| 1857-58 | Fevers - - | 42 | 67 | 68 | 211 | 92 | 80 | 31 | 24 | 47 | 28 | 40 | 67 | |
| | Other diseases | 442 | 383 | 361 | 386 | 409 | 352 | 347 | 295 | 281 | 191 | 218 | 356 | 6,160 |
| | Total - | 484 | 450 | 429 | 597 | 501 | 432 | 378 | 319 | 328 | 219 | 258 | 423 | — |
| 1858-59 | Fevers - - | 34 | 41 | 173 | 213 | 133 | 116 | 72 | 37 | 33 | 24 | 28 | 32 | |
| | Other diseases | 354 | 375 | 423 | 426 | 485 | 378 | 266 | 212 | 289 | 323 | 326 | 376 | 4,899 |
| | Total - | 388 | 416 | 596 | 639 | 618 | 494 | 338 | 249 | 322 | 347 | 354 | 408 | — |
| 1859-60 | Fevers - - | 36 | 62 | 229 | 276 | 197 | 248 | 165 | 116 | 69 | 60 | 32 | 29 | |
| | Other diseases | 394 | 423 | 472 | 549 | 581 | 561 | 551 | 431 | 416 | 409 | 354 | 351 | 6,316 |
| | Total - | 430 | 485 | 701 | 825 | 778 | 809 | 716 | 547 | 485 | 469 | 386 | 380 | — |

WM. L. LANGLEY, M.D.,
Surgeon Major,
P. M. O.

No. 20.

MALTA.—ADMISSIONS for FEVER among troops from April 1st, 1859, to Dec. 31st, 1859.

| Regiment. | Stations. | Admissions. | Deaths. | Remarks. |
|---|---|---|---|---|
| 2—3rd. | Floriana from April 1st to Aug. 26th. Isola Gate, San Francesco, St. Elena Gate, Vittoriosa, from Aug. 27th to Dec. 31st. | 178 | 4 | Average Strength 872. |
| 2—15th. | Fort Verdala from 1st April to 26th Aug. Floriana from 27th Aug. to 25th Nov. Fort Manoel from 26th Nov. to 31st Dec. | 156, of which 1 intermittent. | 5 | Average Strength 697. |
| 2—22nd. | Fort Manoel from May 21st to Nov. 24th. Floriana from Nov. 25th to Dec. 31st. This battalion did not arrive on this station until the 21st of May 1859. | 289, of which 8 intermittent. | 3 | Average Strength 793. |

No. 21.

MALTA.—ADMISSIONS FOR FEVER.

2nd Bat. 23rd Regiment.

| | | |
|---|---|---|
| From Fort Ricasoli, - | 257 | From March 1st, 1859. |
| Died - - | 6 | To Sept. 26th, 1859. |
| Average strength - - - - | 872 | |
| From St. Elmo - | 79 | From Sept. 27th, 1859. |
| Died - - | 11 | To Dec. 31st, 1859. |
| Average strength - - - - - | 857 | |

4th Bat. Rifle Brigade.

| | | |
|---|---|---|
| From St. Elmo - | 74 | From March 1st, 1859. |
| Died - - | 2 | To Sept. 26th, 1859. |
| Average strength - - - - | 824 | |
| From Ricasoli - | 58 | From Sept. 27th, 1859. |
| Died - - | 6 | To Dec. 31st, 1859. |
| Average strength - - - - | 873 | |

From the annexed return, No. 20, it may be seen that fever also prevailed to a great extent this year, in the 2nd Bat. of the 3rd, 2nd Bat. 15th, and 2nd Bat. of the 22nd Regiment.

The 2nd Bat. of the 23rd Regiment moved from Ricasoli on the 26th of September 1859, and relieved the 4th Bat. Rifle Brigade at St. Elmo, who took over the quarters at Fort Ricasoli, previously occupied by the 2nd Bat. of the 23rd Regiment.

W. L. LANGLEY, M.D.,
Surgeon Major,
P. M. O.

No. 22.

ADMISSIONS for FEVERS, from January 1st 1860, to December 31st 1861.

| Regiment. | Station. | Admissions. | | Deaths. | Average Strength. |
|---|---|---|---|---|---|
| 2nd Bat. 3rd Regt. | Fort Verdala | 249 | of which 2 Typhoid, 1 Intermittent | 6 | 859 |
| 2nd Bat. 15th Regt. | Fort Manoel, Isola Gate, San Francesco. | 98 | " 2 Typhoid, 2 Intermittent | 2 | 852 |
| 1st Bat. 22nd Regt. | Couvre Porte, Vittoriosa | 170 | " 2 Typhoid, 1 Intermittent | 1 | 831 |
| 2nd Bat. 22nd Regt. | Floriana | 237 | " 17 Typhoid | 7 | 834 |
| 2nd Bat. 23rd Regt. | Lower St. Elmo | 140 | " 11 Typhoid, 3 Intermittent | 3 | 861 |
| 4th Bat. Rifle Brigade. | Ricasoli | 254 | " " | 1 | 857 |
| Royal Malta Fences | St. James' Cavalier | 6 | " " | 0 | 608 |

W. L. LANGLEY, M.D.
Surgeon Major, P. M. O.

No. 23.

TABLE showing the NUMBER of MEN in all the BARRACKS in MALTA, for every 50 cubic feet of space, from 250 to 800 and upwards, and for every 5 feet of superficial area from 25 to 70 and upwards.

| Name of Barracks. | Cubic Feet. | | | | | | | | | | Superficial Feet. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 250 to 300 | 400 to 450 | 450 to 500 | 500 to 550 | 550 to 600 | 600 to 650 | 650 to 700 | 700 to 750 | 750 to 800 | Above 800. | 25 to 30 | 30 to 35 | 35 to 40 | 40 to 45 | 45 to 50 | 50 to 55 | 55 to 60 | 60 to 65 | 65 to 70 | Above 70. |
| | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. | Number of Men. |
| Upper St. Elmo | - | - | 55 | 148 | 22 | - | - | - | - | - | - | - | 110 | 108 | - | 7 | - | - | - | - |
| Lower St. Elmo | - | - | - | - | 38 | - | 566 | 144 | - | - | - | - | - | - | 422 | 230 | 96 | - | - | - |
| Marsamuscetto | - | - | - | - | - | - | - | - | 84 | - | - | - | - | - | 84 | - | - | - | - | - |
| St. James' Cavalier | - | - | - | - | 64 | - | - | - | - | 72 | - | - | - | - | 136 | - | - | - | - | - |
| St. Peter's Lower Counterguard | - | 56 | - | 41 | 112 | - | - | 19 | - | 41 | 56 | 28 | 13 | 112 | 19 | - | 41 | - | - | |
| Floriana Barracks | - | - | - | 54 | - | 46 | - | 460 | - | - | - | - | 100 | 460 | - | - | - | - | - | 50 |
| St. Francis' Floriana | - | - | 39 | 32 | 45 | - | 23 | 36 | 20 | 134 | 71 | 36 | - | 133 | 89 | - | - | - | - | - |
| Ricasoli | - | - | - | - | 190 | 222 | - | - | - | - | - | 62 | 7 | 324 | - | 19 | - | - | - | - |
| St. Angelo | - | - | - | 84 | 19 | 15 | - | - | - | - | - | 67 | 43 | 8 | - | - | - | - | - | - |
| Couvre Porte, Vittoriosa | - | - | - | - | 20 | 29 | 9 | 4 | - | - | - | - | - | 11 | 6 | 12 | 4 | 12 | 9 | 8 |
| Isola Gate | - | - | - | - | - | 277 | - | - | - | - | - | - | 24 | 48 | 46 | 63 | 64 | - | - | 32 |
| St. Francis di Paola | - | - | - | - | - | 125 | 29 | - | - | - | - | - | 23 | 93 | 31 | - | - | - | 7 | - |
| St. Elena Gate | - | 192 | - | - | - | - | - | - | - | - | - | 192 | - | - | - | - | - | - | - | - |
| Verdala | - | - | 690 | - | - | - | - | - | - | - | - | - | - | 690 | - | - | - | - | - | - |
| St. Salvatore | - | - | - | - | 52 | 71 | 24 | - | - | - | - | - | - | 14 | - | - | - | 12 | - | 7 |
| Zabbar Gate | - | - | - | - | - | 101 | - | - | - | - | - | - | 12 | 45 | - | 44 | - | - | - | - |
| St. Clement's | - | - | - | - | - | - | 48 | - | 8 | - | - | - | - | - | 48 | 8 | - | - | - | - |
| Polverista Gate | - | - | - | - | 252 | - | - | - | - | - | - | - | - | 252 | - | - | - | - | - | - |
| Zeitun Gate | - | - | - | - | - | 41 | - | - | - | - | - | - | - | 15 | - | 15 | 11 | - | - | - |
| Fort Manoel | - | 60 | - | - | 78 | - | 55 | 40 | - | 84 | - | - | - | 66 | 44 | 60 | 54 | - | 42 | 51 |
| Fort Tigne | - | - | 51 | - | 21 | 34 | - | - | - | - | - | - | 32 | - | 54 | - | - | 20 | - | - |
| Chambray, Gozo | - | - | 50 | 45 | 150 | 150 | - | - | - | - | - | - | 345 | 50 | - | - | - | - | - | - |
| Total | - | 60 | 349 | 829 | 530 | 1,076 | 927 | 754 | 703 | 112 | 331 | 127 | 385 | 709 | 2,429 | 979 | 458 | 270 | 44 | 58 | 148 |

No. 24.

TABLE showing the NUMBER of BEDS in all the HOSPITALS, for every 100 cubic feet from 400 to 4,000, and for every 20 superficial feet from 30 to 120.

| Name of Hospital. | Cubic Feet. | | | | | | | | | | | | | | Superficial Feet. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 400 to 500 | 500 to 600 | 700 to 800 | 800 to 900 | 900 to 1,000 | 1,000 to 1,100 | 1,100 to 1,200 | 1,200 to 1,300 | 1,400 to 1,500 | 1,500 to 1,600 | 1,600 to 1,800 | 1,800 to 2,000 | 2,000 to 3,000 | 3,000 to 4,000 | 30 to 40 | 40 to 60 | 60 to 80 | 80 to 100 | 100 to 120 | Above 120. |
| | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. | Number of Beds. |
| General Hospital, Valetta | - | - | 26 | - | 42 | - | 7 | - | 9 | 47 | 30 | 10 | 113 | 96 | 11 | 15 | 83 | 135 | 129 | 7 |
| Vittoriosa Hospital | - | 26 | - | - | 26 | 22 | 66 | - | - | - | - | - | - | - | 26 | - | 68 | 46 | - | - |
| Vittoriosa hired Hospital | 4 | - | 19 | 9 | - | 20 | 4 | - | - | - | - | - | - | - | 4 | 24 | 24 | 4 | - | - |
| Spinola Hospital | - | - | - | 13 | 9 | - | 13 | 6 | - | - | 1 | - | 1 | - | - | - | 28 | 13 | 1 | 1 |
| Total | 4 | 26 | 45 | 22 | 77 | 42 | 90 | 6 | 9 | 47 | 31 | 10 | 114 | 96 | 41 | 39 | 203 | 198 | 130 | 8 |

# APPENDIX TO REPORT ON THE IONIAN ISLANDS.

## No. 1.

Five Years, Meteorological Observations from January 1855 to January 1860, at Corfu.

| Months. | Barometer Mean. | Mean Temperature. | Mean Daily Range. | Mean Maximum | Mean Minimum. | Mean Dry Bulb. | Mean Wet Bulb. | Rain Inches. | Rainy Days per Month. | Winds. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Force in lbs. | Strength. | Direction. |
| | in. | ° | ° | ° | ° | ° | ° | | | | | |
| January - - | 29·922 | 52·3 | 16·8 | 60·4 | 43·6 | 48·8 | 42·2 | 8·76 | 12 | 46·1 | Gales | N.E. |
| February - - | 29·970 | 55·6 | 12·5 | 61·1 | 48·6 | 52·5 | 46·1 | 3·77 | 8 | 42·1 | Moderate | E. |
| March - - | 29·865 | 58· | 16·6 | 65·1 | 48·5 | 55·4 | 50·6 | 3·71 | 9 | 43·4 | Gales | E. |
| April - - | 29·803 | 64·7 | 16·3 | 72·5 | 56·2 | 62·5 | 56·9 | 3·34 | 7 | 51·3 | High winds | S.E. |
| May - - - | 29·852 | 69·4 | 18· | 79· | 61· | 67·7 | 61·7 | 3·18 | 6 | 23·1 | Calm | S.E. |
| June - - - | 29·883 | 78·5 | 17·1 | 86·7 | 69·6 | 72·3 | 66·2 | 1·71 | 0·4 | 26·1 | Calm | N. |
| July - - - | 29·875 | 84·6 | 16·7 | 93·9 | 77·2 | 81·4 | 73·1 | 0·16 | 3 | 38·4 | Calms, occasional storms | N.W. |
| August - - | 29·858 | 84·9 | 16·9 | 93·1* | 76·2 | 83·9 | 74·5 | 1·24 | 2 | 28·2 | Calms | N.W. |
| September - - | 29·958 | 76·8 | 15·3 | 83·9 | 68·6 | 70·7 | 64·3 | 6·05 | 7 | 32·7 | Moderate | S.E. |
| October - - | 29·998 | 76·5 | 16·4 | 84· | 67·6 | 70·2 | 64· | 3·83 | 6 | 34·6 | Moderate | S.E. |
| November - - | 29·977 | 65·8 | 17·8 | 74·7 | 56·9 | 61·6 | 56·1 | 7·2 | 12 | 47·8 | High winds | S.E. |
| December - - | 29·985 | 58·3 | 20·1 | 66·9 | 46·8 | 52·7 | 47·9 | 8·87 | 14 | 40·8 | Moderate | N.E. |

* August 15, 1859, Maximum Temperature = 99°·9.

## No. 2.

Table of Mortality of the Town and Suburbs of Corfu, from the 1st of January 1855 to the 31st December 1860.

| Description of Diseases. | 1855. | | 1856. | | 1857. | | 1858. | | 1859. | | 1860. | | Total Six Years. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | |
| Croup - - - | 14 | 1 | 2 | 6 | 2 | 8 | 4 | 3 | 1 | 4 | 3 | 4 | 52 |
| Febris typhoid - | 26 | 17 | 16 | 14 | 12 | 5 | 16 | 14 | 9 | 4 | 11 | 4 | 148 |
| „ typhus - | 1 | — | 1 | 1 | — | — | — | — | — | — | — | — | 3 |
| „ intermit. - | 2 | 7 | 1 | — | 3 | 1 | — | — | — | — | — | — | 14 |
| „ continua - | — | — | 1 | — | — | — | 4 | 3 | 9 | 5 | 6 | 5 | 33 |
| Erysipelas - - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | — | — | 1 | 10 |
| Dysenteria - - | 5 | 6 | 6 | 8 | 8 | 5 | 6 | 5 | 5 | 3 | 3 | 8 | 68 |
| Diarrhœa - - | 5 | 10 | 7 | 8 | 14 | 12 | 6 | 7 | 8 | 4 | 15 | 6 | 102 |
| Cholera spasmodi. - | 200 | 248 | — | — | — | — | — | — | — | — | — | — | 448 |
| Syphilis - - | 2 | 1 | 1 | — | 1 | 1 | — | — | 1 | 1 | 1 | — | 9 |
| Strictur. ureth. - | — | — | — | — | — | — | — | — | 1 | — | 2 | — | 3 |
| Hydrophobia - - | 1 | — | — | — | — | — | — | — | — | — | — | — | 1 |
| Leprosy - - | 1 | 1 | — | — | — | — | — | — | — | — | — | — | 2 |
| Scorbutus - - | — | — | — | — | — | — | — | — | — | — | 1 | — | 1 |
| Rachitis - | — | — | — | 1 | 3 | 2 | — | — | — | — | — | 1 | 7 |
| Podagra - - | 1 | — | — | — | — | — | — | — | — | — | — | — | 1 |
| Anasarca - - | 5 | 3 | 8 | 7 | 6 | 3 | 1 | — | 7 | 4 | 3 | 4 | 51 |
| Carcinoma - - | 2 | 4 | 5 | 2 | 7 | 7 | 8 | 8 | 2 | 2 | 9 | 7 | 63 |
| Scirrhoma - - | 5 | 3 | 1 | 2 | 2 | — | 1 | — | 3 | — | — | 2 | 19 |
| Scrofula - | 34 | 21 | 24 | 19 | 7 | 6 | 18 | 23 | 4 | 4 | 4 | 3 | 167 |
| Mesenteric disease - | 36 | 27 | 26 | 29 | 32 | 34 | 31 | 23 | 30 | 28 | 24 | 27 | 347 |
| Peritonitis - - | 2 | 6 | — | 5 | 3 | 2 | 1 | 4 | 6 | 1 | 3 | 5 | 38 |
| Hæmoptysis - - | — | — | — | 1 | 2 | 1 | — | — | 2 | — | 2 | — | 8 |
| Phthisis pulmonalis | 54 | 37 | 34 | 27 | 32 | 25 | 37 | 38 | 36 | 33 | 27 | 28 | 408 |
| Meningites - - | 6 | 4 | 12 | 4 | 12 | 9 | 13 | 8 | 21 | 11 | 17 | 14 | 131 |
| Encephalitis - - | 14 | 11 | 3 | 6 | 4 | 9 | 7 | 6 | 7 | 5 | 6 | 5 | 83 |
| Myelitis - - | — | — | 2 | — | 2 | 1 | 1 | — | 3 | 1 | — | 1 | 11 |
| Apoplexia - - | 30 | 22 | 21 | 19 | 26 | 19 | 16 | 17 | 23 | 21 | 30 | 15 | 259 |
| Paralysis - - | 8 | 8 | 4 | — | — | — | 2 | 1 | 5 | 4 | 3 | — | 35 |
| Delirium tremens - | — | — | — | — | — | — | — | — | 2 | — | 1 | — | 3 |
| Dementia - - | — | — | — | — | 1 | 1 | — | 2 | — | — | — | 1 | 5 |
| Epilepsia - - | 2 | 4 | 1 | 1 | — | 2 | 1 | 1 | — | 1 | 5 | — | 18 |
| Tetanus - - | 2 | 1 | 3 | — | 2 | — | 3 | — | 4 | 1 | 3 | 1 | 20 |
| Eclampsia - - | 20 | 8 | 13 | 9 | 12 | 15 | 14 | 12 | 12 | 12 | 15 | 13 | 155 |

Table of Mortality, &c.—*continued.*

| Description of Diseases. | 1855. | | 1856. | | 1857. | | 1858. | | 1859. | | 1860. | | Six Total Years. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | |
| Otitis | — | — | — | — | — | — | — | — | 1 | — | — | — | 1 |
| Morb. cordis | 23 | 20 | 28 | 25 | 21 | 19 | 23 | 18 | 22 | 35 | 17 | 23 | 274 |
| Angina pectoris | — | — | — | — | 3 | — | 1 | — | 1 | — | — | — | 5 |
| Syncope | — | — | 2 | — | — | — | — | — | — | 2 | — | — | 4 |
| Arteritis | — | — | 2 | — | — | — | — | — | — | — | — | — | 2 |
| Phlebitis | — | — | 1 | — | — | 1 | — | — | 1 | 1 | 1 | — | 5 |
| Laryngitis | 10 | 2 | — | 2 | 2 | 1 | 8 | 6 | 1 | 2 | 5 | 1 | 40 |
| Bronchitis | 31 | 37 | 27 | 28 | 23 | 22 | 42 | 36 | 27 | 36 | 33 | 23 | 365 |
| Pleuritis | 4 | 6 | 2 | — | 1 | — | — | — | 2 | 3 | — | — | 18 |
| Hydrothorax | 6 | 3 | 2 | 3 | 3 | 8 | 1 | 1 | 3 | 1 | 3 | — | 34 |
| Empyema | 5 | 4 | 10 | 6 | 10 | 4 | — | — | 4 | 3 | 5 | 7 | 58 |
| Apoplex. pulm. | 4 | 3 | 12 | 8 | 16 | 8 | 5 | 2 | 6 | 3 | 5 | 3 | 75 |
| Pneumonia | 10 | 13 | 13 | 15 | 20 | 9 | 16 | 12 | 14 | 6 | 17 | 6 | 151 |
| Asthma | 4 | 1 | 1 | — | 1 | 1 | — | — | — | — | — | 2 | 10 |
| Gastritis | 6 | 7 | 7 | 6 | 12 | 10 | 5 | 11 | 12 | 10 | 10 | 12 | 108 |
| Enteritis | 12 | 18 | 6 | 7 | 11 | 10 | 10 | 11 | 15 | 16 | 14 | 12 | 142 |
| Ileus | — | — | — | — | — | — | — | — | — | — | — | 3 | 3 |
| Hernia | 4 | — | 1 | — | — | — | — | — | — | — | — | 1 | 6 |
| Colica | 4 | — | — | 2 | 1 | 2 | — | — | — | — | 1 | — | 10 |
| Hæmatemesis | — | — | — | 2 | — | — | — | — | — | — | — | — | 2 |
| Mælena | — | — | 1 | — | — | — | 1 | — | — | — | — | — | 2 |
| Hæmorrhois | — | — | — | — | 1 | 1 | — | 6 | — | — | 1 | 2 | 11 |
| Fistula | — | — | 1 | — | — | — | — | — | — | — | — | — | 1 |
| Splenitis | — | — | — | — | 1 | 1 | — | — | — | — | — | — | 2 |
| Hepatitis | 1 | 1 | 2 | 4 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 4 | 31 |
| Ascites | — | — | 1 | 2 | 2 | 3 | — | — | — | — | — | — | 8 |
| Nephritis | — | — | — | 1 | — | 1 | 1 | — | 1 | 1 | — | — | 5 |
| Ischuria | — | 2 | — | — | — | — | — | — | — | — | — | — | 2 |
| Diabetes | — | — | — | — | — | — | — | — | — | — | 1 | 2 | 3 |
| Calculus vesicæ | — | — | 1 | — | — | — | — | — | — | — | — | — | 1 |
| Cystitis | — | — | — | — | 2 | — | — | — | 2 | 2 | — | — | 6 |
| Tumor uter. | — | 7 | — | 2 | — | — | — | — | — | — | — | 2 | 11 |
| Arthritis | — | — | — | 1 | 1 | — | — | — | — | — | — | — | 2 |
| Ulcus | — | — | — | — | — | — | — | — | — | — | 2 | — | 2 |
| Natus Mortuus | 18 | — | 12 | — | 10 | — | 15 | — | 24 | — | 23 | — | 102 |
| Premat. birth | 12 | — | 13 | 6 | 12 | 11 | 18 | 7 | 10 | 8 | 9 | 10 | 116 |
| Atelectas. organ. | 12 | — | 10 | 4 | 8 | 7 | 10 | 10 | 3 | 3 | 9 | 6 | 82 |
| Dentitio | 5 | — | 4 | — | 5 | 4 | 4 | 1 | 3 | 2 | 4 | 2 | 34 |
| Partus | — | 1 | — | 1 | — | 4 | — | — | — | 1 | — | 2 | 9 |
| Senectus | 21 | 18 | 9 | 7 | 14 | 13 | 10 | 6 | 12 | 14 | 11 | 7 | 142 |
| Atrophia | 16 | 25 | 15 | 11 | 17 | 14 | 16 | 3 | 25 | 17 | 10 | 12 | 181 |
| Chronic. catarrh | — | — | — | — | 3 | 3 | 9 | 7 | 8 | 6 | 7 | 15 | 58 |
| Debility | 13 | 15 | 18 | 22 | 19 | 16 | 16 | 17 | 12 | 14 | 24 | 23 | 209 |
| Suffocatio | — | 1 | 1 | — | — | — | — | — | — | — | — | — | 2 |
| Fracture | 2 | — | 1 | — | — | — | — | — | — | — | — | — | 3 |
| Vulnus | 4 | — | 1 | — | — | — | 1 | — | 1 | 1 | 1 | — | 9 |
| Accid. death | — | — | — | — | 2 | 1 | 4 | 3 | — | — | — | — | 10 |
| Hydrocephal. | 10 | 10 | 10 | 2 | 18 | 16 | 12 | 11 | 13 | 15 | 7 | 5 | 129 |
| Asphyxia | — | — | — | — | 3 | 3 | — | 2 | 2 | — | 1 | 1 | 12 |
| Chlorosis | — | — | — | — | — | — | — | 2 | — | — | — | 2 | 4 |
| Hypertrophia | — | — | — | — | — | — | — | — | 1 | 1 | 1 | — | 3 |
| Spasm. cough | — | — | — | — | 2 | 5 | 1 | — | 6 | 6 | — | 1 | 21 |
| Sudden death | — | — | — | — | — | — | — | — | 1 | 1 | 2 | 1 | 5 |
| Elephantiasis | — | — | — | — | — | — | — | — | — | 1 | — | — | 1 |
| Ostitis | — | — | — | — | — | — | — | — | — | — | 1 | — | 1 |
| Total of deaths | 716 | 645 | 407 | 337 | 441 | 369 | 423 | 351 | 437 | 363 | 423 | 345 | — |

Average of Deaths per Year.

| | |
|---|---|
| Males | 474 |
| Females | 401 |
| | *875 |

* Including 200 Males and 248 Females died of Cholera in the year 1855.

POPULATION.

| | Males. | Females. |
|---|---|---|
| Town | 9,245 | 8,454 |
| Suburbs | 4,501 | 3,812 |
| Total | 13,746 | 12,266 |

General Health Office, Corfu, 5th November 1861.

Visé E. F. BARR, Director-General.

NICO. RODILI, Chief Clerk.

## Appendix No. 3.

### Statistics of the Civil Hospital in Corfu from the Year 1855 to the Year 1860.

| — | Detail of the Diseases. | 1855. | | | | 1856. | | | | 1857. | | | | 1858. | | | | 1859. | | | | 1860. | | | | Total. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | |
| | | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. |
| 1 | Fever, ephemeral | 2 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 4 | – | – | – |
| 2 | „ adynamic | 1 | 1 | 1 | 1 | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | 1 | – | 4 | – | 2 | – | 7 | 1 | 4 | 1 |
| 3 | „ typhoid | 3 | 1 | 1 | 1 | 4 | 1 | 2 | 1 | 6 | – | 3 | – | 2 | – | 2 | – | 1 | – | 1 | – | 2 | – | 1 | – | 18 | 2 | 10 | 2 |
| 4 | „ gastric | 6 | – | – | – | 8 | 2 | 1 | – | 3 | 1 | 1 | – | 5 | – | 1 | – | – | – | – | – | 16 | 1 | – | – | 38 | 4 | 3 | – |
| 5 | „ rheumatic | 39 | 5 | – | – | 14 | 2 | – | – | 31 | 4 | – | – | 41 | – | – | – | 15 | – | – | – | 21 | 2 | – | – | 161 | 13 | – | – |
| 6 | „ nervous | – | – | – | – | 1 | – | 1 | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 2 | – | 1 | – |
| 7 | „ intermittent, simple | 27 | – | – | – | 42 | 4 | – | – | 25 | 2 | – | – | 35 | 1 | – | – | 21 | – | – | – | 48 | – | 1 | – | 198 | 7 | 1 | – |
| 8 | Fever, intermittent, pernicious | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | 2 | – | 1 | – | 3 | 1 | – | – | 8 | 1 | 1 | – |
| 9 | Erysipelas | 2 | – | 1 | – | 6 | 1 | – | – | 2 | – | 1 | – | 3 | – | – | – | 5 | – | 1 | – | 2 | – | – | – | 20 | 1 | 3 | – |
| 10 | Measles | – | – | – | – | – | – | – | – | 5 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 6 | – | – | – |
| 11 | Chicken pox | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – | – | – | – | – | 2 | 1 | – | – |
| 12 | Anæmia | – | – | – | – | – | – | – | – | – | – | – | – | 3 | – | – | – | – | – | – | – | – | – | – | – | 3 | – | – | – |
| 13 | Hydroæmia | 1 | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 3 | – | – | – |
| 14 | Scrofulous cachexia | 2 | 3 | – | 1 | 2 | 1 | – | – | 5 | – | – | – | 1 | 1 | – | – | – | – | – | – | 1 | – | – | – | 11 | 5 | – | 1 |
| 15 | Rachitis | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 16 | Articular rheumatism, acute | 9 | – | – | – | 3 | – | – | – | 7 | – | – | – | 3 | 1 | – | – | 12 | – | – | – | 10 | – | – | – | 44 | 1 | – | – |
| 17 | Articular rheumatism, chronic | 1 | – | – | – | 1 | – | 1 | – | – | – | – | – | 2 | – | – | – | 5 | – | 1 | – | 7 | 2 | – | – | 16 | 2 | 2 | – |
| 18 | Pleurodynia | 7 | – | – | – | 11 | – | – | – | 6 | – | – | – | 6 | – | – | – | 4 | – | – | – | 2 | – | – | – | 36 | – | – | – |
| 19 | Rheumatalgia | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 3 | 1 | – | 1 | 1 | – | – | – | 3 | 2 | – | – | 9 | 3 | – | 1 |
| 20 | Lumbago | – | – | – | – | 4 | – | – | – | 2 | – | – | – | 8 | – | – | – | 1 | – | – | – | 1 | – | – | – | 16 | – | – | – |
| 21 | Encephalitis | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 22 | Meningitis | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | 2 | – | 1 | – | 1 | – | 3 | – | 3 | – |
| 23 | Apoplexy | 2 | – | 2 | – | 5 | 3 | 3 | 3 | 3 | 1 | 3 | 1 | 3 | – | 3 | – | 10 | 1 | 5 | 1 | 5 | 3 | 3 | 1 | 28 | 8 | 19 | 6 |
| 24 | Eclampsia | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 |
| 25 | Hypochondriasis | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – | 2 | – | – | – | 3 | – | – | – | 7 | – | – | – |
| 26 | Delirium tremens | 2 | – | – | – | 1 | – | – | – | 3 | – | – | – | 7 | – | – | – | 5 | – | – | – | 2 | – | – | – | 20 | – | – | – |
| 27 | Myelitis | 1 | 1 | – | 1 | 1 | – | – | – | 1 | – | 1 | – | – | – | – | – | 2 | – | 1 | – | 1 | – | – | – | 6 | 1 | 2 | 1 |
| 28 | Spinal meningitis | – | – | – | – | 2 | – | 2 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | 2 | – |
| 29 | Tic doloreux | – | – | – | – | 2 | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | 2 | 1 | – | – |
| 30 | Cephalalgia | 1 | – | – | – | 4 | – | – | – | 4 | 2 | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 10 | 2 | – | – |
| 31 | Sciatica | 2 | – | – | – | 1 | – | – | – | 2 | – | – | – | 1 | – | – | – | 3 | – | – | – | 3 | – | – | – | 12 | – | – | – |
| 32 | Paralysis | – | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – | – | 1 | – | 1 | 3 | 1 | – | 1 |
| 33 | Hemiplegia | 4 | – | 1 | – | 3 | – | – | – | 2 | 1 | – | – | – | 1 | – | – | – | – | – | – | 1 | 1 | – | 1 | 10 | 3 | 1 | 1 |
| 34 | Paraplegia | 1 | – | – | – | 1 | – | 1 | – | – | – | – | – | 1 | 1 | – | 1 | – | – | – | – | – | – | – | – | 3 | 1 | 1 | 1 |
| 35 | Epilepsia | 3 | – | 1 | – | 2 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 3 | – | – | – | 9 | – | 1 | – |
| 36 | Dementia | 1 | – | – | – | – | – | – | – | 1 | – | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – | 4 | – | – | – |
| 37 | Chorea | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – |
| 38 | Hysteria | – | 1 | – | – | – | – | – | – | – | 2 | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | 5 | – | – |
| 39 | Structural disease of the heart | 10 | – | 8 | – | 9 | – | 7 | – | 7 | 1 | 5 | 1 | 11 | – | 6 | – | 10 | 1 | 4 | – | 8 | 4 | 5 | 3 | 55 | 6 | 35 | 4 |
| 40 | Endocarditis | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – |
| 41 | Phlebitis | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | 1 | – | 1 | – | – | – | – | – | – | – | 3 | – | 1 | – |
| 42 | Laryngitis | 1 | – | – | – | 4 | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 7 | – | – | – |
| 43 | Bronchitis | 32 | – | – | – | 37 | – | – | – | 29 | 1 | – | – | 59 | – | 1 | – | 31 | – | – | – | 32 | – | – | – | 220 | 1 | 1 | – |
| 44 | „ chronic | 3 | – | – | – | 7 | 1 | 2 | – | 2 | – | – | – | 3 | – | 1 | – | 3 | – | – | – | 3 | – | 2 | – | 21 | 1 | 5 | – |
| 45 | „ capillaris | 1 | – | – | – | 2 | – | 2 | – | – | – | – | – | 2 | – | 1 | – | 2 | – | 1 | – | 4 | – | 2 | – | 11 | – | 6 | – |
| 46 | „ senilis | 2 | 1 | 1 | – | 3 | – | 2 | – | 3 | – | 3 | – | 3 | – | 3 | – | 1 | 1 | – | – | – | – | – | – | 12 | 2 | 9 | – |
| 47 | Asthma | 3 | – | – | – | 7 | – | 1 | – | 3 | – | 1 | – | 3 | – | – | – | 1 | – | – | – | 4 | – | 1 | – | 21 | – | 3 | – |
| 48 | Pneumonitis | 9 | 1 | 4 | 1 | 23 | – | 10 | – | 13 | 2 | 2 | 1 | 15 | 1 | 1 | – | 9 | – | 1 | – | 11 | 1 | 3 | – | 80 | 5 | 21 | 2 |
| 49 | Hæmoptysis | – | – | – | – | 1 | – | – | – | 4 | – | – | – | 2 | – | – | – | 2 | – | – | – | 1 | – | – | – | 10 | – | – | – |
| 50 | Phthisis pulmonalis | 10 | – | 8 | – | 14 | 2 | 8 | 1 | 9 | 1 | 3 | – | 16 | – | 7 | – | 10 | – | 7 | – | 15 | 3 | 6 | 1 | 74 | 6 | 39 | 2 |
| 51 | Pleuritis | 7 | – | – | – | 3 | – | – | – | 5 | – | – | – | 5 | – | – | – | 2 | – | – | – | 8 | 2 | – | – | 30 | 2 | – | – |
| 52 | Empyema | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 2 | – | – | – | – | – | – | – | 3 | – | – | – |
| 53 | Stomatitis mercurialis | – | – | – | – | 1 | – | – | – | – | – | – | – | 8 | – | – | – | 1 | 1 | 1 | – | 7 | – | – | – | 17 | 1 | 1 | – |
| 54 | Tonsillitis | 3 | – | – | – | 10 | – | – | – | 11 | – | – | – | 5 | – | – | – | 2 | – | – | – | 2 | – | – | – | 33 | – | – | – |
| 55 | Parotitis | 1 | – | 1 | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 3 | – | 1 | – |
| 56 | Gastritis | 2 | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 3 | – | 1 | – |
| 57 | Indigestion | 98 | 2 | – | – | 47 | 1 | – | – | 51 | 1 | – | – | 56 | 3 | – | – | 30 | – | – | – | 90 | 7 | – | – | 372 | 14 | – | – |
| 58 | Dyspepsia | – | – | – | – | 1 | – | – | – | – | – | – | – | 2 | – | – | – | 1 | – | – | – | – | – | – | – | 4 | – | – | – |
| 59 | Gastralgia | 10 | – | – | – | 3 | – | – | – | 2 | – | – | – | 3 | – | – | – | 2 | – | – | – | 1 | – | – | – | 21 | – | – | – |
| 60 | „ chronica | 1 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – |
| 61 | Hæmatemesis | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 62 | Enteritis | 1 | – | 1 | – | 5 | – | 2 | – | – | – | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – | 8 | – | 3 | – |
| 63 | Diarrhœa | 15 | 2 | 4 | – | 13 | – | – | – | 7 | 3 | 1 | – | 2 | 1 | – | – | 8 | – | 1 | – | 4 | 3 | 1 | 1 | 49 | 9 | 7 | 1 |
| 64 | „ chronica | – | – | – | – | 1 | – | 1 | – | – | – | – | – | 1 | – | 1 | – | 2 | – | 2 | – | 1 | 2 | 1 | 1 | 5 | 2 | 5 | 1 |
| 65 | Dysenteria | 3 | 1 | – | 1 | 6 | – | – | – | 3 | – | 1 | – | 2 | – | – | – | 5 | – | – | – | 6 | – | 2 | – | 25 | 1 | 3 | 1 |
| 66 | „ chronica | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – |
| 67 | Melæna | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – |
| 68 | Colica | 1 | – | – | – | 2 | – | – | – | 6 | – | – | – | 2 | – | – | – | 9 | – | – | – | 4 | – | – | – | 24 | – | – | – |
| 69 | Tympanitis | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – |
| 70 | Piles | 2 | – | – | – | 2 | – | – | – | 3 | 1 | – | – | 5 | – | – | – | 11 | – | – | – | 9 | – | – | – | 32 | 1 | – | – |
| 71 | Tabes mesenterica | 1 | – | – | – | 8 | – | 7 | – | 2 | 3 | 2 | 2 | 1 | – | 1 | – | 1 | – | – | – | – | 1 | – | 1 | 13 | 4 | 10 | 3 |
| 72 | Intus-susception | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | 1 | – | 1 | 1 | 1 | 1 | 1 |
| 73 | Worms | – | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – |
| 74 | European cholera | 3 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 3 | – | – | – |
| 75 | Jaundice | – | – | – | – | – | – | – | – | 2 | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 4 | – | – | – |

## Statistics of the Civil Hospital in Corfu—*continued.*

| — | Detail of the Diseases. | 1855. | | | | 1856. | | | | 1857. | | | | 1858. | | | | 1859. | | | | 1860. | | | | Total. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | |
| | | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. |
| 76 | Hepatitis | 3 | – | – | – | 4 | – | 1 | – | 4 | 1 | – | – | 3 | – | – | – | 1 | – | – | – | 5 | – | – | – | 20 | 1 | 1 | – |
| 77 | Biliary concretions | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – |
| 78 | Enlargement of the spleen | – | – | – | – | 1 | 1 | – | – | 1 | 1 | – | 1 | 1 | – | – | – | 2 | – | – | – | – | – | – | – | 5 | 2 | – | 1 |
| 79 | Enlargement of the liver and spleen | – | – | – | – | 1 | – | – | – | 3 | 1 | – | – | 4 | – | – | – | 1 | – | – | – | 2 | 1 | 1 | – | 11 | 2 | 1 | – |
| 80 | Peritonitis | – | – | – | – | 2 | – | 1 | – | – | – | – | – | – | – | – | – | 2 | 1 | 1 | – | 1 | 1 | 1 | – | 5 | 2 | 3 | – |
| 81 | Ascites | 2 | 1 | 1 | – | 1 | 1 | 1 | – | 4 | 1 | 2 | 1 | – | 2 | – | 1 | 2 | 1 | 1 | 1 | 3 | – | 3 | – | 12 | 6 | 8 | 3 |
| 82 | Anasarca | 1 | – | – | – | 2 | 2 | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | 4 | – | 1 | – | 9 | 2 | 1 | – |
| 83 | Nephritis | 1 | – | – | – | – | – | – | – | 1 | – | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – | 4 | – | – | – |
| 84 | Renal calculi | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – |
| 85 | Bright's disease | – | – | – | – | – | – | – | – | 1 | – | 1 | – | 1 | – | 1 | – | – | – | – | – | – | 1 | – | – | 2 | – | 2 | – |
| 86 | Albuminuria | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 1 | 1 | – |
| 87 | Hæmaturia | – | – | – | – | – | – | – | – | 1 | – | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – | 3 | – | – | – |
| 88 | Diabetes mellitus | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | 1 | – | 1 | – |
| 89 | Enuresis | – | – | – | – | – | – | – | – | 1 | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 1 | – | – |
| 90 | Dysmenorrhœa | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – |
| 91 | Metritis | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – | 3 | – | – |
| 92 | Cancer of uterus | – | 3 | – | 2 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 3 | – | 2 |
| 93 | Strumous ophthalmia | – | – | – | – | – | – | – | – | – | 2 | – | – | – | 1 | – | – | 2 | – | – | – | – | – | – | – | 2 | 3 | – | – |
| 94 | Otitis externa | 2 | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 4 | – | – | – |
| 95 | „ interna | 1 | – | – | – | 2 | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – | 6 | – | – | – |
| 96 | Urticaria | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | 1 | – | – | – | 1 | 1 | – | – |
| 97 | Phtiriasis | – | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – |
| 98 | Ecthyma | – | – | – | – | 1 | – | – | – | – | – | – | – | 7 | – | – | – | 2 | – | – | – | 4 | – | – | – | 14 | – | – | – |
| 99 | Zoster | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | 1 | – | – | – |
| 100 | Herpes | 1 | – | – | – | – | 1 | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 3 | 2 | – | – |
| 101 | Lepra | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – |
| 102 | Scabies | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 2 | – | – | – | 1 | – | – | – | – | 1 | – | – | 5 | 1 | – | – |
| 103 | Pemphigus | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 104 | Rupia | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | 2 | – | – | – |
| 105 | Syphilitic eruptions | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | 1 | – | – | – | 2 | 1 | – | – |
| 106 | Tinea capitis | – | – | – | – | 2 | – | – | – | 1 | – | – | – | 3 | 1 | – | – | – | – | – | – | 2 | – | – | – | 8 | 1 | – | – |
| 107 | Podagra | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – |
| 108 | Pregnancy | – | 1 | – | – | – | 3 | – | – | – | 6 | – | – | – | 1 | – | – | – | 1 | – | – | – | 6 | – | – | – | 18 | – | – |
| 109 | Tetanus traumaticus | – | – | – | – | 1 | – | 1 | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 3 | – | 2 | – |
| 110 | Abscess, acute | 10 | – | – | – | 15 | – | 1 | – | 6 | 1 | – | – | 10 | – | – | – | 7 | 1 | 1 | – | 13 | – | – | – | 61 | 2 | 2 | – |
| 111 | „ chronic | 5 | 1 | 1 | – | 3 | – | 1 | – | – | – | – | – | 3 | – | 1 | – | 2 | 1 | 1 | 1 | 2 | 1 | 1 | – | 15 | 3 | 5 | 1 |
| 112 | Diffused phlegmon | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | – | 1 | – | 1 | – | – | – | – | 3 | 1 | – | 1 |
| 113 | Erysipelatous phlegmon | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 114 | Ulcers | 10 | 1 | – | – | 13 | 2 | 1 | – | 12 | – | 1 | – | 3 | – | – | – | 16 | 2 | 1 | – | 9 | 1 | – | – | 63 | 6 | 3 | – |
| 115 | „ gangrenous | – | 1 | – | 1 | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | 1 | – | – | – | 3 | 1 | 2 | 1 |
| 116 | Humid gangrene | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | 1 | – | – | – | 2 | – | 1 | – | 3 | 1 | 1 | 1 |
| 117 | Dry „ | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | 1 | – | 1 | – |
| 118 | Fibrous tumours | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – |
| 119 | Glandular tumours | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 2 | – | – | – | 1 | – | – | – | 4 | – | – | – |
| 120 | Cystic tumours | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 121 | Exostose | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – |
| 122 | Epithelioma | – | – | – | – | – | – | – | – | 1 | – | – | – | 2 | – | – | – | – | – | – | – | 1 | – | – | – | 4 | – | – | – |
| 123 | Cancer | 1 | – | 1 | – | 1 | – | – | – | 4 | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 7 | – | 2 | – |
| 124 | Punctured wounds | 2 | – | – | – | 2 | – | – | – | 6 | – | 1 | – | 3 | – | – | – | 2 | – | – | – | 4 | – | – | – | 19 | – | 1 | – |
| 125 | Contusions | 7 | 1 | – | – | 16 | – | – | – | 8 | – | – | – | 6 | – | – | – | 18 | – | – | – | 24 | – | 1 | – | 79 | 1 | 1 | – |
| 126 | Gun-shot wounds | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – | – | – | – | – | 3 | – | – | – |
| 127 | Burns | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | 4 | – | – | – |
| 128 | Gonorrhœa | 8 | 8 | – | – | 11 | 11 | – | – | 14 | 17 | – | – | 5 | 22 | – | – | 7 | 26 | – | – | 9 | 2 | – | – | 54 | 86 | – | – |
| 129 | Syphilitic primary ulcers | 20 | 24 | – | – | 19 | 21 | – | – | 12 | 14 | – | – | 22 | 30 | – | – | 8 | 22 | – | – | 7 | 26 | – | – | 88 | 137 | – | – |
| 130 | Syphilitic vegetations | – | 1 | – | – | 3 | 1 | – | – | – | – | – | – | – | 5 | – | – | 3 | 26 | – | – | – | 18 | – | – | 6 | 51 | – | – |
| 131 | Condylomata | – | 1 | – | – | 1 | 1 | – | – | 7 | 3 | – | – | 2 | 1 | – | – | 2 | – | – | – | 2 | 2 | – | – | 15 | 7 | – | – |
| 132 | Bubos | 3 | – | – | – | 4 | 1 | – | – | 4 | 2 | – | – | 8 | 2 | – | – | 4 | 1 | – | – | 10 | – | – | – | 33 | 6 | – | – |
| 133 | Secondary syphilis | 6 | 2 | – | – | 4 | 2 | – | – | 18 | – | – | – | 6 | 1 | – | – | 11 | 1 | – | – | 7 | 1 | 1 | – | 52 | 7 | 1 | – |
| 134 | Tertiary „ | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | 5 | – | – | – |
| 135 | Caries of bones of the hands | – | – | – | – | 1 | – | 1 | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 2 | – | 1 | – |
| 136 | Caries of the ribs | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | 2 | – | 1 | – |
| 137 | Fractures of skull | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – |
| 138 | „ humerus | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 2 | – | – | – |
| 139 | „ radius | – | – | – | – | 1 | 1 | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 2 | 1 | – | – |
| 140 | „ phalanges of the hands | – | – | – | – | 1 | – | – | – | 3 | – | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – | 6 | – | – | – |
| 141 | Fractures of ribs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – |
| 142 | „ femur | – | – | – | – | 2 | – | – | – | – | – | – | – | 2 | 2 | – | – | – | – | – | – | 1 | – | – | – | 5 | 2 | – | – |
| 143 | „ tibia | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | 4 | – | – | – | – | – | – | – | 7 | – | – | – |
| 144 | „ fibula | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 3 | – | – | – |
| 145 | Diseases of joints | 3 | – | – | – | 2 | – | – | – | 1 | – | – | – | 4 | – | 1 | – | – | – | – | – | 3 | – | – | – | 13 | – | 1 | – |
| 146 | Coxalgia | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 147 | Luxations of humerus | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | 4 | – | – | – |
| 148 | Luxations of femur | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 149 | Strain of the foot | 3 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | 5 | – | – | – |
| 150 | Strain of the hand | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 151 | Wounds of arteries | – | – | – | – | 1 | – | – | – | – | – | – | – | 2 | – | 2 | – | – | – | – | – | 1 | – | – | – | 4 | – | 2 | – |
| 152 | Diseases of the eye | 5 | – | – | – | 5 | – | – | – | 4 | 1 | – | – | 4 | 1 | – | – | 1 | – | – | – | 9 | 1 | – | – | 28 | 3 | – | – |
| 153 | Injuries of the throat | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |

Statistics of the Civil Hospital in Corfu—*continued.*

| — | Detail of the Diseases. | 1855. | | | | 1856. | | | | 1857. | | | | 1858. | | | | 1859. | | | | 1860. | | | | Total. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | | Admissions. | | Deaths. | |
| | | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. |
| 154 | Injuries of the thorax | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| 155 | Hernia, strangulated | 2 | – | 1 | – | 4 | – | – | – | 2 | 1 | 1 | – | – | – | – | – | 2 | – | 1 | – | – | – | – | – | 10 | 1 | 3 | – |
| 156 | Bubonocele - - | – | – | – | – | – | – | – | – | 2 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | 3 | – | – | – |
| 157 | Enterocele - - | – | – | – | – | 4 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 5 | – | – | – |
| 158 | Diseases of rectum - | – | – | – | – | 2 | – | – | – | – | – | – | – | 2 | – | – | – | 2 | – | – | – | 6 | – | – | – | 12 | – | – | – |
| 159 | „ urinary organs - - | 1 | – | – | – | 2 | – | 1 | – | 1 | – | – | – | 2 | – | 1 | – | 1 | 5 | – | – | 6 | 1 | 1 | – | 13 | 6 | 3 | – |
| 160 | Strictures of the urethra | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 3 | – | 1 | – | 2 | – | 1 | – | 6 | – | 2 | – |
| 161 | Diseases of genital organs - - | 6 | – | – | – | 6 | – | – | – | 7 | – | – | – | 9 | – | – | – | 8 | – | – | – | 3 | – | – | – | 39 | – | – | – |
| 162 | Diseases of breast - | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | 1 | – | 1 | – | 1 | – |
| 163 | Excoriations - - - | – | – | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – | 1 | – | – | – | – | – | – | – | 3 | – | – | – |
| 164 | Diseases of female genital organs - | – | 4 | – | – | – | 1 | – | – | – | 2 | – | – | – | 4 | – | – | – | 29 | – | – | – | 37 | – | – | – | 77 | – | – |
| 165 | Anthrax - - - | 2 | – | – | – | – | – | – | – | 1 | 1 | – | – | – | – | – | – | – | – | – | – | 2 | – | – | – | 5 | 1 | – | – |
| 166 | Boils - - - - | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | 1 | – | – | – | 3 | – | – | – | 2 | – | – | – | 9 | – | – | – |
| | Total - - | 449 | 69 | 39 | 9 | 488 | 68 | 63 | 6 | 426 | 82 | 36 | 7 | 472 | 87 | 39 | 4 | 383 | 125 | 41 | 4 | 512 | 141 | 44 | 11 | 2,730 | 572 | 262 | 41 |

Dr. C. Laurano,
Physician and Surgeon of the Civil Hospital.

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## No. 4.

Dalla Commissione Centrale Medica,
Corfù, li 27 Settembre 1860.

Onorevole Signore,

La Commissione Centrale Sanitaria, estraordinariamente adunata si li 17 corrente, fece lettura dell' istanza avvanzata da varj abitanti del Borgo di Manduchio all' Onorevole Direttore Generale di Sanità sulla pessima condizione de conduttori e necessarj, e da ciò le numerose malattie miasmatiche che infestano quel Borgo. Oltrecciò, presero conoscenza dell' esposizione fatta dal protomedico, e dal suo assistente, su tale argamento, rimessa alla sullodata autorità sanitaria, nonchè le misure da essi proposte. Infine, essa veniva informata dallo stesso presidente che tale istanza rimessa a sua Eccellenza il Lord Alto Commissionario questi degnavasi di gettarvi sguardo benigno e si è data premura di rimetterla alla Commissione Medica con raccomandazione onde fosse presa in matura considerazione come pure si occupasse d'investigare sulla condizione di tutti i conduttori della città, e de' sobborghi, e fare su ciò il rapporto scientifico, relativo al caso, allo scopo che il governo passa, in conoscenza di causa, procedere a qualche spesa, onde riorganizzare il lavoro in questione, e togliere i pessimi effetti che traggono sorgente dal attuale sistema.

La Commissione Medica prese ad esaminare l' importante questione la quale richiede al certo i provedimenti del Governo, assoggetta all' Eccellenza sua, per mezzo del suo preside quanto segue.

Che tutti i conduttori, in generale, si della città che de' Borghi di Manduchio, Castrades, e Molino a vento deffettano nella loro costruzione, percui rendono l'atmosfera al sommo grado morbifera.

Che i principali diffetti di questi consistono, in quanto che giacciono superficiali. Non hanno sufficente declive ; sboccano vicinissimi alla spiaggia, e le aperture che attrovansi ad intervalli alla parte superiore de' conduttori sono per lo più scoperti, od hanno i coperchi infranti ciòchè dà più facilmente luogo alla libera esalazione de' miasmi. Oltreciò, la Commissione Medica osserva che i necessarii mancano da più abitazioni. Che la pessima costruzione, e disposizione degli attuali, non in libera comunicozione co' pubblici conduttori sotterranei, costituiscono una causa ancora, che influisce sullo stato morbifero dell' atmosfera.

E fatto incontrastabile che la costruzione de' pubblici conduttori e necessarj, la disposizione de' medesimi, nonchè il modo col quale vengono ripuliti, constituisconò importante argomento sotto l'aspetto di pubblica igiene. Oltre l' incomodo che accagiona il puzzo de' conduttori, male costrutti, i pericoli a' quali sono esposti gli abitanti della città e dei sobborghi, e le malattie miasmatiche e generalmente quelle di carattere pestilenziale sono si generalmente conosciute che riesce inutile di qui esporli.

Di pari guisa, con cui il medico pratico cura da malattia gl' individui cosi al medico pubblico è devoluto il conoscere, e togliere, tra le varie cause, questa di cui fassi cenno, e dalla quale possono risultare diverse malattie epidimiche.

Volendosi quindi allontanare e prevenire i perniziosi effetti risultanti dalla cattiva costruzione de' conduttori, è uopo impedire la genesi de' miasmi, le esalazioni che impregnano l' aria, ed il contaggio dell' atmosfera.

Uopo non vi ha di teorici saggi onde comprovare il vero della quistione, allorquando la quotidiana esperienza chiaramente dimostra che le immondizie in generale nella stagione estiva in cui vi annidano quantità d' insetti giungono al massimo grado di putridine, causa essenziale dello stato morbifero dell' atmosfera.

Al certo le misure principali da adottarsi circa il sistema de' conduttori sotteranei e necessari, col più felice successo, per conciliare la mondezza e l' igiene della città e sobborghi sono.

1°. Che niuna via vadi priva di conduttore sotterraneo.

2°. Che i conduttori abbiano il maggior dedivio possibile, onde facilitare il corso delle immondizie e delle acque, e lo sbocco di queste sul mare.

3°. Che i conduttori siano di forma cilindrica, od ovale, e costrutti in modo da offerire una base concava e sufficientemente larga onde non dia adito alle immondizie ed alle acque di stazionare, e putrefarsi, e rinnovare il contaggio, ma che neppure possino queste, facilmente trascinate, internarsi nelle pareti de medesimi.

4°. Che i conduttori sieno muniti nella parte superiore, di aperture a distanze onde servino di ricevitori de' piccoli conduttori confluenti i quali vi conducono la pioggia ed i ghioccioni delle case in generale, e

servino d' introduzione agli operaj i quali dovranno accomodare, o pulire siffatti conduttori. Che le aperture suddette sieno garantite da coperchi di pietra o da inferriate.

5to. Che una corrente d' acqua in grande quantità, scorra colla massima precipitazione, in tempo di siccità, per entro i conduttori stessi e per siffatto modo si puliscano, e vadino mondi di morbifere esalazioni.

6to. Che i conduttori, giacciono sufficientemente sotterra onde non sieno danneggiati e guasti dal passaggio delle carrozze, e per l' analoga profondità non mandino sgradevole odore o malsane esalazioni.

7mo. Che l' uscite de conduttori in mare non si effettuino semplicemente nella spiaggia, ma che sbocchino a certa profondità, e ad una distanza analoga di modochè le acque possano trascinare le immondizie, e non tramandare malsane esalazioni.

Accurata sorveglianza dovrebbesi ingiungere nell' accomodare o pulire i conduttori come pure adottare misure per impedire il propagarsi d' infette esalazioni come p. e. sarebbe il non permettere la pulitura durante l' estate e le giornate calde e molto meno durante il giorno.

I pericoli, risultanti dalle corrotte esalazioni, emananti da necessarii, e le misure preventive da doversi adottare onde evitarli, costituisce argomento di molta importanza, ed uno de principali della polizia medica che concerni la purezza dell' aria, e questi richiedono del pari la considerazione del Governo.

Poichè, ammesso che i pubblici conduttori sotterranei sieno pulitissimi e per loro costruzione scevri da qualsivoglia esalazione malsana, se nelle abitazioni particolari v' ha la fonte dell' infezione, l' atmosfera sarà egualmente malsana e perniziosa, per il che ogni abitazione dovrebbe andare fornita di relativo necessario, in libera comunicazione co' pubblici conduttori sotterranei, e la mondezza de' medesimi sia sorvegliata onde non rendi l' abitazione stessa malsana e sgradevole.

Ma oltreciò, le vie devono essere pulite di frequente, ne sia permesso l' accumularsi di immondizie, e il getto dalle case.

I canaletti ai latti delle vie, devono pure apparire mondi da tutto ciò che può impedire il libero corso delle acque, e quindi, devono essere spazzati e giornalmente lavati.

Osservasi però che siccome gli abitanti non attrovansi sempre in situazione propria per dare corso a loro bisogni, è necessario che misure relative siano prese onde conciliare il comodo de' cittadini colla mondezza della città e de' sobborghi col stabilire in luoghi appositi lattrine o pubblici ricevitoj costrutti in modo che non tramandino esalazioni.

Tali sono i principii che la Commissione Medica raccomanda circa il sistema de' conduttori sotterranei e necessarj il quale molto concorre alla mondezza e l' igiene della città e de' sobborghi.

Però, forse l' effettuare di un tale piano, su di basi tali, richiede non picciol dispendio, percui in primo luogo questo lavoro devesi maturamente ponderare, ed in secondo, l'esecuzione del piano suesposto doversi affidare ad esperto ingegnere, colla cooperazione di una Commissione Medica.

Di più, oltre il suddetto lavoro richiedonsi pure alcuni regolamenti quali possono concorrere a mantenere il sistema, e pel conseguimento de' buoni risultati di questo rame di pubblica igiene.

La Commissione Medica arguisce nell' atto che a misure urgenti dovrassi procedere, riguardo il sobborgo di Manduchio, crede che saggiamente l'Onorevole Presidente ordinava l'appertura de' sbocchi de' conduttori sotterranei e la chiusura de spiragli, mediante coperti di ferro oltrociò sarebbe necessario di emanare ordini relativi, perchè le pubbliche vie di Manduchio siano spazzate almeno una volta per settimana dopo che le imminenti pioggie verranno al certo porre un termine alle malattie che infestano quel sobborgo, e ciò per ora, per l' avvenire poi che il Governo voglia adottare sul proposito misure più radicali a norma delle basi suaccennate.

E. F. Barr,
Presidente della Commission Medica Centrale.

All' Onorevole Signore,
Il Signor E. F. Barr,
F. f. di Segretario di S.E. il L.A.C.,
&c. &c. &c.
Corfu.

Vera traduzione rilasciata per ordine del Presidente,
Officio Centrale della Commissione,
Corfù, 30 Ottobre 1861,
Nico. Rodili, Segretario.

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## No. 5.

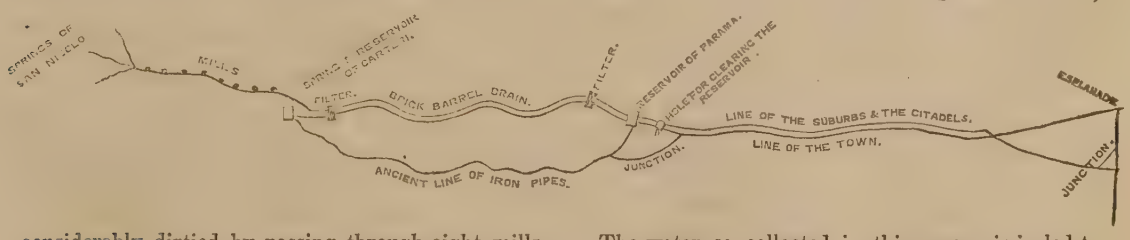
Memorandum of Water Supply requested by the Sanitary Commissioners.

The supply of water for the town of Corfu, the suburbs, and the citadels, is derived from the spring of Carteri and from those of San Nicolo, upon Binosoa, at seven miles distance from the town (1).

The water of Carteri is clear and abundant at every season, but it contains many salts in solution, and is not sufficiently aired. It issues in a small reservoir, from which it enters in two different lines.

One of these lines is a brick barrel drain of two feet diameter, and the other an ancient one of iron pipes, which having been abandoned since the construction of the barrel drain, was lately put again in activity.

The water of San Nicolo issues in many places at a little distance the one from the other, clear and fresh at its source, it becomes, in spite of all care,




considerably dirtied by passing through eight mills, before its arrival near the reservoir of Carteri, where it falls into the above-mentioned brick barrel drain.

The water supplied by this drain passes through two filters, the one situated near the reservoir of Carteri, the other near the reservoir of Peramo and before it, in order to stop the substances which are in suspension in the water, and to diminish as much as possible the incrustations formed in the iron pipes. Thence it falls into the reservoir of Peramo, in which falls also the water carried by the above said line of iron pipes.

The water so collected in this reservoir is led to the entrance of the town by two lines of iron pipes of nine inches diameter, one for the town and the other for the citadels and the suburbs.

These two separated lines can by their branches be joined at every occasion near the esplanade, and the line of the town being also united near the reservoir of Peramo to the iron line, which from Carteri leads the water to this reservoir, the water can be led from the springs into the town, the suburbs, and the citadels by two different lines, one of which is independent of the reservoir of Peramo ; consequently

every inconvenience in the supply of water can be prevented.

Finally, branches of iron pipes of four, three, and two inches diameter lead the water to the principal points, and partial lead pipes, three-quarter inches diameter, furnish it to the consumers by 1,382 cocks, divided as follows :—

| | | |
|---|---|---|
| *Line of the Town.* | | |
| For public fountains | 29 | |
| For private houses, shops, and public establishments | 1,096 | |
| For gardens | 5 | |
| | | 1,130 |
| *Line of the Suburbs.* | | |
| For public fountains | 13 | |
| For private houses, shops, and public establishments | 133 | |
| For gardens | 6 | |
| For the citadels | 100 | |
| | | 252 |
| Total | | 1,382 |

The volume furnished by this number of cocks is very variable in the different seasons, at every day of the week, and on different hours of the day, but at middle term we can take the volume of 324,250 gallons per day, and from that volume the citadels receive about 50,400 gallons per day.

Such a quantity of water is furnished from the spring of Carteri alone during eight months in the year, and consequently at that time the water of San Nicolo is not employed, especially on account of its dirtiness.

During the other four months, to the water of Carteri is added that of San Nicolo, of which every care is taken to render it as clear as possible; and sometimes, when the rains are scarce, that period is still prolonged, and all the waters of Carteri and San Nicolo united together are not sufficient to make the above-mentioned volume, in order to satisfy all the enormous exigencies of the inhabitants and the waste of water they make day and night.

However, we must observe that during the above-said eight months the supplied quantity of water could be increased if, besides the usual distribution, the exceeding water, which runs uselessly at Peramo and Carteri, was employed to fill the cisterns and reservoirs of the citadel as well as those of the town, which stand in need of repair, and which would offer a great advantage if they were put in activity under the power of the Aqueduct Commission.

In the other four months the supplied quantity of water would be also increased, especially for the citadels, whose line, although of nine inches diameter, as that of the town, and lately in great part renewed and cleaned from the ancient incrustations, supplies the water only to 252 cocks. The water would be better in quality if the eight mills existing at San Nicolo were destroyed.

That being done, the volume of water now supplied by the different springs of San Nicolo would be easily increased on making some excavation; and after having collected this water at a reservoir, it could be carried regularly in a barrel drain to Carteri without sustaining any loss, and its good qualities would be preserved.

These works concerning the cisterns of the town and the spring of San Nicolo are of the first necessity. At the same time, the completing of the filter lately constructed at Peramo, the renewing of many parts of the existing barrel drain, from which, in spite of all repair, the water runs uselessly, some measures for the distribution of water in the town, the covering of the reservoirs of Carteri and Peramo, and the junction of this last reservoir with the line of the suburbs, are works required in order to obviate every inconvenience, and to put that aqueduct in such a degree of perfection as will make it rival the aqueducts of the principal towns of the world, not only for the quantity of the supplied water, but also for its good qualities.

(Signed) B. Pieri Lahihiopulo.

Corfu, Nov. 25, 1861.

True copy,
J. K. Kane, Clerk, 2d class,
Royal Engineer Department.

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Chemical Department,
Royal Arsenal, Woolwich, S.E.,
July 4, 1862.

Memorandum for the Inspector-General of Fortifications, with reference to samples of water forwarded for analysis by the Commanding Royal Engineer at Corfu, in accordance with a recommendation contained in a Report made by the Chemist of the War Department, on samples of water from Corfu in March 1861.

These samples were received on the 27th August 1861 and the 10th April 1862. The results of analysis of the samples first received could not be reported upon until the whole series had been examined.

The four samples were contained in stoppered glass bottles completely filled, as recommended in my Report of March 5th 1861.

The results of their analyses fully confirm the conclusion to which I was led by the examination of the first series of samples, which were sent from Corfu in earthenware jars, and were reported upon in March 1861. Those jars, in consequence of their very porous nature, and of their containing free lime in their composition, had produced a change in the composition of the waters which they contained, resulting in the almost complete removal of carbonate of lime from them. Hence, their analysis afforded no explanation of the formation of considerable deposits of carbonate of lime in the service pipes at Corfu.

The four samples which form the subject of the present report have, however, furnished analytical results which readily account for the production of those deposits in the pipes which led to the present inquiry.

The following are the principal solid constituents contained in the four samples of water, calculated upon the imperial gallon :—

| | I. San Nicolo Water taken at its Source, at the Junction of all the small Springs. | II. San Nicolo Water, after its Passage through Eight Miles. | III. Water of the Spring of Carteri. | IV. Water of the united Springs of Carteri and San Nicolo, in the State it falls into the Reservoir of Parama. |
|---|---|---|---|---|
| | grs. | grs. | grs. | grs. |
| Carbonate of lime | 12·99 | 12·60 | 16·52 | 14·00 |
| Carbonate of magnesia | 3·02 | 2·20 | 1·79 | 1·53 |
| Sulphate of lime | 6·85 | 6·66 | 13·33 | 8·96 |
| Sulphate of magnesia | 3·68 | 2·85 | 8·39 | 6·80 |
| Chloride of sodium | 1·37 | 1·25 | 1·99 | 1·48 |
| Oxide of iron and alumina | 0·42 | 0·30 | — | trace. |
| Organic matter | 2·24 | 2·00 | 2·38 | 1·80 |
| Total solid constitutents (direct estimation) | 30·58 | 29·96 | 44·40 | 34·80 |

It appears from the above results that:—(1.) the "San Nicolo" water contains a considerable proportion of carbonate of lime, besides a small quantity of carbonate of magnesia. The sulphates of lime and magnesia are also present in proportions sufficiently great to add considerably to the hardness of the water.

(2.) The passage of the "San Nicolo" water through eight mills, and the considerable amount of agitation to which it must thus be subjected, does not have the effect of reducing to any important extent the proportion of earthy carbonates in the water. There is no doubt, however, that the subsequent deposition of these carbonates from the water is greatly promoted by its passage through the mills, as the free carbonic acid gas originally contained in the water must be expelled thereby to a considerable extent. For earthy carbonates to remain in solution in water during its passage through great lengths of pipe, and its occasional exposure to air, in tanks and reservoirs, it is essential that the water should contain a decided excess of free carbonic acid gas beyond the proportion necessary to hold the carbonates in solution. If the quantity of gas dissolved is reduced by agitation or exposure of the water to an amount about equal to that which is contained in the carbonates of lime and magnesia themselves, the deposition of these will speedily commence, since any further escape of carbonic acid will deprive the water of the power of holding them in solution.

The *total* amount of carbonic acid gas in some of the San Nicolo water was carefully determined (the material for this purpose being taken from perfectly full and tolerably well-stoppered bottles). The result obtained in this experiment showed that there was only just sufficient free carbonic acid present in the water to keep the carbonates of lime and magnesia in solution. Several bottles containing the San Nicolo water, and of which the stoppers fitted very imperfectly, were found to have become coated on the inside with crystalline deposits of the earthy carbonates originally in solution in the water. The gradual escape of some of the carbonic acid from the water, favoured by the agitation to which the latter had been subjected in its passage to this country, had led to the formation of these deposits, which, therefore, corresponded exactly in their nature and the mode of their production to the incrustations found in the service pipes at Corfu. The deposits in question were more particularly observed in bottles containing the San Nicolo water, collected after its passage through eight mills.

(3.) The water from the spring of Carteri contains more carbonate of lime, and very considerably more earthy sulphates, than the San Nicolo water. It is, indeed, an exceedingly hard water, and one which could be only very partially softened by artificial means.

All the bottles which were filled with this water exhibited crystalline deposits of the earthy carbonates, like those above referred to, which were more or less considerable, according to the degree of tightness with which the stoppers fitted, and the consequent extent to which the free carbonic acid in the water could make its escape during the transmission of the bottles from Corfu.

It will be seen from the above that the continual production of incrustations in the service pipes at Corfu is explained by the great hardness of the waters constituting the supply, and by the facility with which the water deposits a portion of its earthy carbonates when exposed to agitation, such as it must be subjected to in passing through great lengths of pipe.

There is no doubt that the only practicable method which would be effectual in preventing the formation of those incrustations is that of the separation of the earthy carbonates from the water by Clark's softening process. By its application to the supply of water at Corfu, the quality of the latter, as regards hardness, would, of course, also be considerably improved.

I am unaware whether the employment of the liming process, which is in itself a simple and an inexpensive one, would be attended by any great local difficulties, but it is unquestionably the only efficient remedy against the incrustations complained of.

I need scarcely point out that the quality of the Corfu water supply (with special reference to its hardness) would be improved if the water from the Carteri spring were not included in it.

J. A. Abel,
Chemist of the War Department.

No. 6.

Table showing the Total Admissions and Deaths from the principal Diseases occurring among an average Strength of 2,208 British Troops at Corfu and Vido during 10 years from 1st April 1850 to 31st March 1860.

| Diseases. | Total in Ten Years. | |
|---|---|---|
| | Admissions. | Deaths. |
| Fevers: | | |
| Intermittent | 377 | 2 |
| Remittent | 199 | 12 |
| Continued | 1,999 | 46 |
| Typhus and Typhoid | † 54 | 14 |
| Eruptive | 167 | 5 |
| Cholera | 70 | 36 |
| Diarrhœa | 1,503 | 5 |
| Dysentery | 72 | 3 |
| Hepatic disease | 137 | 3 |
| Rheumatism | 804 | 4 |
| Phthisis | 105 | 41 |
| Other pulmonary diseases | 2,365 | 36 |
| All other diseases | 12,938 | 56 |
| Total | 20,790 | 263 |

## No. 7.

RETURN showing the NUMBER of ADMISSIONS into HOSPITAL and DEATHS a

1. For the 13 Weeks ende

| Regiments and Detachments. | Station. | Barracks. | Average Strength. | CLASS I.—ZYMOTIC DISEASES. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLASS II. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Order 1.—Miasmatic Diseases. | | | | | | | | | | | | | | | | | Order 2. | | | | | | | | | | | | | | | | | | | 3. | 4. | | | 2. | | | | | |
| | | | | Parotitis. | Tonsilitis. | Influenza. | Ophthalmia. | Furunculus. | Diarrhœa. | Febris Intermittens. | Febris Remittens. | Febris Typhoides. | Febris Typhus. | Febris Continua. | Anthrax. | Rheumat. Acutus. | Rheumat. Chronicus. | Syphilis Primaria. | Syphilis Secundaria. | Bubo. | Gonorrhœa. | Phymosis, &c. | Orchitis (Gonorrhœal). | Strict. Urethræ. | Lepra. | Ehriositas. | Scabies. | Tænia Solium. | Ascaris Lumbric. | Apithiæ. | Lumbago. | Scrofula. | Morbus Coxarius. | Phthisis Pulmon. | Hæmoptysis. | Tuberculosis. | Delirium Tremens. | Mania. | Epilepsia. | Cephalæa. | Tetanus. | Dyscœa. | Cataract. | Tænia Pahebra. |
| Royal Artillery and Royal Engineers | Corfu and Vido - | Citadel - | 584 | 1 | 4 | – | 1 | – | 3 | – | – | – | – | 3 | – | 6 | – | – | – | 2 | 4 | – | – | – | – | 1 | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 |
| 2d Battalion 2d Regiment - - | Do. - | Do. - | 867 | – | 3 | – | 1 | 3 | 4 | 8 | 2 | – | – | 10 | 1 | 5 | 1 | 3 | 1 | 1 | 5 | – | – | – | 1 | 1 | – | – | 1 | – | 1 | 1 | – | – | – | – | – | – | – | – | – | – |
| 2d Battalion 4th Regiment - - | Do. - | Fort Neuf | 824 | – | 6 | 5 | 5 | 1 | 5 | – | – | 2 | – | 12 | – | – | 3 | 1 | – | 3 | 2 | – | – | 1 | – | 2 | – | – | – | – | – | 1 | – | 7 | – | – | – | – | – | – | – |
| 1st Battalion 9th Regiment - - | Do. - | Citadel - | 669 | – | 3 | – | 9 | – | 4 | – | – | – | 1 | 5 | – | 2 | – | 2 | 1 | 1 | 5 | – | – | – | – | 1 | – | – | – | 4 | – | – | – | – | – | – | – | – | – | – | – |
| Men of 2d Battalion 9th Regiment attached to above corps. | Do. - | Do. - | 16 | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Detachment 2d Battalion 4th Regiment. | Paxo - - - | San Nicolo Fort. | 33 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 |
| Detachments Royal Artillery and 1st Battalion 9th Regiment. | Santa Maura - | Fort - | 115 | – | – | – | 1 | – | – | – | 1 | – | – | – | – | 1 | – | – | 1 | – | – | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – |
| Head-quarters 2d Battalion 9th Regiment. | Cephalonia - - | Town - | 544 | – | 4 | – | 2 | – | 2 | 4 | – | – | – | 1 | – | 1 | – | 4 | 1 | – | 10 | 1 | – | 1 | – | – | – | – | – | 2 | – | – | – | – | – | – | – | – | – | – | – |
| Detachments Royal Artillery and 1st Battalion 9th Regiment. | Ithaca - - - | Town - | 56 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Detachment Royal Artillery, Left Wing 2d Battalion 9th Regiment. | Zante - - - | Castle and Town. | 321 | – | 2 | – | 3 | – | 1 | – | – | – | – | 2 | – | – | – | 10 | 2 | 1 | 3 | 1 | 1 | – | – | 2 | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | 1 |
| Detachment 1st Battalion 9th Regiment. | Cerigo - - - | Castle - | 31 | – | – | 2 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Total - - - - - | - - - - | - - - | 4,060 | 1 | 22 | 7 | 23 | 5 | 19 | 12 | 3 | 2 | 1 | 33 | 2 | 15 | 4 | 20 | 7 | 8 | 29 | 2 | 1 | 2 | 1 | 5 | 2 | 1 | 1 | 2 | 1 | 7 | 1 | 8 | 3 | | | | | | | |

2. For the 13 Weeks ende

| Regiments and Detachments. | Station. | Barracks. | Average Strength. | CLASS I.—ZYMOTIC DISEASES. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLASS II. | | | | | | | | | | | | | | | | | | |

## No. 7.

ch STATION in the IONIAN ISLANDS, for the first Nine Months of 1861,

iday the 29th of March 1861.

| CLASS III.—LOCAL DISEASES. | | |

No. 7.—Return showing the Number of Admissions into Hospital and Deaths

3. For the 13 Weeks ende

| Regiments and Detachments. | Stations. | Barracks. | Average Strength. | Class I.—Zymotic Diseases. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | II. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Order 1.—Miasmatic Diseases. | | | | | | | | | | | | | | | | | | | | Order 2. | | | | | | | | 3. | | | 4. | | Orde 2. | |
| | | | | Parotitis. | Tonsilitis. | Ophthalmia. | Erysipelas. | Furunculus. | Dysent. Acuta. | Dysent. Chronica. | Diarrhœa. | Iritis. | Feb. Intermitt. | Feb. Remittens. | Feb. Typhoides. | Feb. Continua. | Feb. Recurrens. | Anthrax. | Rheum. Acut. | Rheum. Chronic. | Pterygium. | Erythema. | Syphilis Prim. | Syphilis Secund. | Iritis Syphil. | Bubo. | Gonorrhœa. | Orchitis (Gonorrhœal.) | Stricture Urethræ. | Scorbutus. | Ebriositas. | Tænia Solium. | Vermes. | Scrofula. | Phthisis Pulm. |
| Royal Artillery and Engineers | Corfu and Vido | Citadel | 558 | 1 | 4 | 1 | 1 | – | – | – | 3 | 1 | 1 | – | – | 15 | – | – | 5 | 1 | – | 1 | 21 | 6 | 1 | 5 | 8 | 1 | – | 1 | 2 | – | 1 | – | – |
| 2d Battalion 2d Regiment | Do. | Do. | 878 | – | 3 | 6 | – | – | – | 1 | 14 | – | 12 | 12 | 1 | 77 | – | 1 | 3 | – | – | – | 19 | 1 | – | 8 | 20 | 1 | – | – | 1 | – | 1 | 1 | 3 |
| 2d Battalion 4th Regiment | Do. | Fort Neuf | 794 | – | 6 | 5 | 1 | 2 | – | – | 22 | – | 3 | – | 5 | 177 | – | – | 4 | – | – | – | 7 | 1 | – | 4 | 4 | – | 1 | – | 7 | – | – | – | 4 |
| 1st Battalion 9th Regiment | Do. | Citadel | 680 | – | – | 7 | – | 1 | 2 | – | 45 | – | 1 | 7 | – | 56 | – | – | – | – | – | – | 11 | – | – | 2 | 4 | – | – | – | 1 | – | – | – | – |
| Men of 2d Battalion, 9th Regiment, attached. | Do. | Do. | 22 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Detachment 2d Battalion, 4th Regiment. | Paxo | San Nicolo Fort. | 33 | – | 1 | – | – | – | – | – | 1 | – | 8 | – | – | 10 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | – | – | – |
| Detachments Royal Artillery and 1st Battalion 9th Regiment. | Santa Maura | Fort | 132 | – | – | 2 | – | – | – | – | 1 | – | 4 | 2 | – | 1 | 1 | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Head-quarters, 2d Battalion 9th Regiment, and Detachment Royal Artillery. | Cephalonia | Town | 552 | – | 5 | 16 | – | – | – | – | 4 | – | – | – | – | 255 | – | – | 4 | – | – | – | – | – | – | – | 6 | – | – | – | 1 | – | – | 1 | – |
| Detachments Royal Artillery and 1st Battalion 9th Regiment | Ithaca | Town | 70 | – | – | – | – | – | – | – | 5 | – | – | – | – | 4 | – | – | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Detachments Royal Artillery and 2d Battalion 9th Regiment. | Zante | Castle and Town. | 317 | – | – | 1 | – | – | – | – | 2 | – | – | – | – | 42 | – | – | 1 | – | 1 | – | 2 | 3 | – | 3 | 4 | – | – | – | – | – | – | – | – | – |
| Detachment 2d Battalion 4th Regiment. | Cerigo | Castle | 32 | – | 1 | – | – | – | – | – | – | – | 6 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Total | – | – | 4,068 | 1 | 20 | 38 | 2 | 3 | 2 | 1 | 97 | 1 | 35 | 21 | 6 | 637 | 1 | 1 | 18 | 1 | 1 | 1 | 60 | 12 | 1 | 22 | 46 | 2 | 1 | 1 | 12 | 1 | 2 | 2 | 7 |

Summary of Returns of Admissions into Hospital and Deaths durin

| Class. | Order. | | 13 Weeks ended 29th March. | | 13 Weeks ended 28th June. | | 13 Weeks ended 27th September. | | Total in Nine Months. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Average Strength - - | 4,060. | | 4,040. | | 4,068. | | | |
| | | Diseases. | Admitted. | Died. | Admitted. | Died. | Admitted. | Died. | Admitted. | Died. |
| | 1 | Miasmatic diseases - - - | 149 | 6 | 291 | 4 | 887 | 12 | 1,327 | 22 |
| | 2 | Enthetic „ - - - | 70 | — | 115 | 1 | 144 | — | 329 | 1 |
| | 3 | Dietic „ - - - | 5 | — | 15 | — | 13 | — | 33 | — |
| | 4 | Parasitic „ - - - | 6 | — | 4 | — | 3 | — | 13 | — |
| I. | | Total Zymotic Diseases - - | 230 | 6 | 425 | 5 | 1,047 | 12 | 1,702 | 23 |
| | 1 | Diathetic diseases - - - - | 1 | — | 1 | — | — | — | 2 | — |
| | 2 | Tubercular „ - - - | 19 | 2 | 15 | 1 | 12 | — | 46 | 3 |
| II. | | Total Tubercular Diseases - - | 20 | 2 | 16 | 1 | 12 | — | 48 | 3 |
| | | Diseases of the— | | | | | | | | |
| | 1 | Nervous system - - - - | 18 | — | 9 | 1 | 21 | — | 48 | 1 |
| | 2 | Circulatory „ - - - - | 4 | — | 5 | — | 9 | — | 18 | — |
| | 3 | Respiratory „ - - - - | 48 | 1 | 48 | 1 | 54 | 2 | 150 | 4 |
| | 4 | Digestive „ - - - - | 38 | — | 41 | 1 | 67 | 1 | 146 | 2 |
| | 5 | Urinary „ - - - - | 3 | — | 2 | — | — | — | 5 | — |
| | 6 | Reproductive system - - - | 4 | — | 6 | — | 5 | — | 15 | — |
| | 7 | Locomotive „ - - - | 2 | — | 3 | — | 8 | — | 13 | — |
| | 8 | Integumentary „ - - - | 107 | — | 99 | — | 149 | — | 355 | — |
| III. | | Total Local Diseases - - | 224 | 1 | 213 | 3 | 313 | 3 | 750 | 7 |

each STATION in the IONIAN ISLANDS, for the First Nine Months of 1861—*continued.*

Friday the 27th of September 1861.

| CLASS III.—LOCAL DISEASES. | | |

No. 8.

RETURN showing the NUMBER of ADMISSIONS into HOSPITAL and DEATHS from FEVERS from the various BARRACKS, &c. in CORFU and VIDO, between the 1st of January and 31st of October 1861.

| Barracks, &c. | Venetian Barracks Citadel, Corfu. | | | Bomb-Proof Barracks Citadel. | | | Lower Fort Neuf Barracks. | | | Upper Fort Neuf Barracks. | | | Tents, Fort Neuf. | | | Huts, Fort Neuf. | | | Fort Abraham. | | | Vido Barracks. | | | Tents and Huts, Vido. | | | Lazaretto. | | | Total. | | Average Monthly Strength. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corps. | R. A. and 1st Battn. 9th. | | | R. E. and 2nd Battn. 2nd. | | | 2nd Battn. 4th. | | | R. A. and 2nd Battn. 4th. | | | 2nd Battn. 4th. | | | 2nd Battn. 4th. | | | 2nd Queen's. | | | R. A. and 2nd Battn. 2nd. 2nd Battn. 4th. 1st Battn. 9th. | | | 2nd Battn. 2nd. 2nd Battn. 4th. and 1st Battn. 9th. | | | 1st Battn. 9th. | | | — | | |
| Average Strength. | 862 | Fever Cases. | | 728 | Fever Cases. | | 336 | Fever Cases. | | 211 | Fever Cases. | | 66 | Fever Cases. | | 54 | Fever Cases. | | 146 | Fever Cases. | | 374 | Fever Cases. | | 140 | Fever Cases. | | 4 | Fever Cases. | | No. of Fever Cases. | | |
| 1861. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Monthly Strength. | Admitted. | Died. | Admitted. | Died. | |
| January | 879 | 3 | 1 | 720 | 3 | – | 338 | 4 | 1 | 196 | 1 | – | — | – | – | 69 | – | – | 130 | 3 | – | 471 | 1 | – | 99 | 1 | 1 | 4 | – | – | 16 | 3 | 2,906 |
| February | 861 | 2 | 1 | 726 | 6 | – | 336 | 3 | 1 | 195 | 2 | – | — | – | – | 67 | 1 | – | 133 | 1 | – | 456 | – | – | 122 | – | – | 4 | – | – | 15 | 2 | 2,900 |
| March | 961 | 4 | – | 682 | 6 | – | 370 | 1 | – | 242 | 2 | 1 | — | – | – | 69 | – | – | 133 | 1 | – | 342 | – | – | 102 | – | – | 4 | – | – | 14 | 1 | 2,905 |
| April | 885 | 7 | 1 | 745 | 7 | – | 369 | – | – | 238 | – | – | — | – | – | 64 | – | – | 146 | 3 | – | 353 | – | – | 100 | – | – | 4 | – | – | 17 | 1 | 2,904 |
| May | 887 | 16 | 1 | 765 | 14 | – | 360 | 4 | – | 225 | – | – | — | – | – | 59 | – | – | 134 | 1 | – | 371 | 3 | – | 92 | 1 | – | 4 | – | – | 39 | 1 | 2,897 |
| June | 891 | 16 | 1 | 739 | 16 | – | 333 | 5 | 1 | 218 | 3 | – | 54 | – | – | 43 | 3 | – | 150 | 3 | – | 366 | – | – | 119 | 3 | – | 4 | – | – | 49 | 2 | 2,917 |
| July | 853 | 39 | 2 | 741 | 25 | – | 312 | 15 | 1 | 201 | 3 | – | 88 | 8 | – | — | 16 | – | 145 | 6 | – | 329 | 2 | – | 185 | 2 | – | 4 | 1 | – | 117 | 3 | 2,858 |
| August | 864 | 21 | – | 752 | 30 | 3 | 316 | 53 | – | 193 | 17 | – | 102 | 30 | – | — | 2 | – | 140 | 19 | – | 315 | 6 | 1 | 185 | 2 | – | 4 | – | 1 | 180 | 5 | 2,871 |
| September | 792 | 14 | 2 | 748 | 16 | 2 | 312 | 12 | – | 204 | 3 | 1 | 50 | 14 | – | 43 | – | – | 186 | 7 | – | 290 | 3 | – | 213 | 1 | – | 4 | – | – | 70 | 5 | 2,842 |
| October | 747 | 13 | – | 662 | 9 | – | 321 | 3 | – | 205 | 2 | – | 36 | 1 | 2 | 21 | 2 | – | 169 | 2 | – | 450 | 2 | – | 191 | – | 1 | 4 | – | – | 34 | 3 | 2,806 |
| Total | Average 862 | 135 | 9 | Average 728 | 132 | 5 | Average 336 | 100 | 4 | Average 211 | 33 | 2 | Average 66 | 53 | 2 | Average 54 | 24 | – | Average 146 | 46 | – | Average 374 | 17 | 1 | Average 140 | 10 | 2 | Average 4 | 1 | 1 | 551 | 26 | 2,880 |
| Ratio per 1,000 Strength — Admissions. | — | 156 | – | — | 181 | – | — | 297 | – | — | 156 | – | — | 803 | – | — | 444 | – | — | 315 | – | — | 454 | – | — | 71 | – | — | – | – | 191 | – | — |
| Ratio per 1,000 Strength — Deaths | — | – | 10·4 | — | – | 6·8 | — | – | 11·9 | — | – | 9·4 | — | – | 30·3 | — | – | – | — | – | – | — | – | 2·6 | — | – | 14·3 | — | – | – | 9·2 | — |

Principal Medical Officer's Office,
Corfu, 5th November 1861.

F. WM. INNES, M.D.,
Deputy Inspector General of Hospitals.

RETURN showing the MONTHLY AVERAGE DAILY of SICK in HOSPITAL in the several CORPS in GARRISON, from 1st January to 31st October 1861.

| Corps. | Royal Artillery and Engineers. | 2nd Battalion 2nd Regiment. | 2nd Battalion 4th Regiment. | 1st Battalion 9th Regiment. | Total. |
|---|---|---|---|---|---|
| Average Strength - - - | 543 | 865 | 801 | 671 | 2,880 |
| January 1861 - - - | 1·5 | 3·7 | 3·0 | 0·5 | 8·7 |
| February „ - - - | 1·0 | 2·5 | 5·5 | 1·0 | 10·0 |
| March „ - - - | 0·7 | 2·5 | 4·0 | 1·0 | 8·2 |
| April „ - - - | 0·0 | 3·5 | 1·7 | 2·2 | 7·4 |
| May „ - - - | 1·5 | 6·0 | 3·5 | 3·5 | 14·5 |
| June „ - - - | 3·5 | 5·7 | 7·2 | 3·7 | 20·1 |
| July „ - - - | 1·5 | 10·0 | 13·2 | 13·2 | 37·9 |
| August „ - - - | 3·7 | 14·5 | 20·7 | 11·5 | 50·4 |
| September „ - - - | 4·7 | 7·5 | 13·0 | 5·5 | 30·7 |
| October „ - - - | 8·2 | 3·7 | 9·0 | 1·5 | 22·4 |
| Average of each Corps - | 2·6 | 5·9 | 8·0 | 4·3 | — |
| Deaths in each Corps - | 3 | 4 | 9 | 10 | 26 |

## No. 9.

STATISTICS of SICKNESS and MORTALITY in the MILITARY PRISON, VIDO.

| Year ended | Number of Prisoners admitted throughout each Year. | Average Daily Strength of Prisoners. | Average Daily Sick. | Number of Sick Prisoners. | | | | | | Medical Officer of the Prison Annual Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Admitted in Sick Ward of Prison during each Year. | Number of Fever Cases in the above Admissions. | Transferred to Hospital at Corfu for Treatment. | Number of Fever Cases in the above Number transferred. | Total. Sick Prisoners. | Total. Fever Cases. | |
| 31st December 1850 - - | 216 | $40\frac{132}{365}$ | $3\frac{36}{365}$ | 76 | 16 | 4 | 1 | 80 | 17 | — |
| „ 1851 - - | 214 | $34\frac{184}{365}$ | $1\frac{156}{365}$ | 24 | 1 | 7 | 2 | 31 | 3 | — |
| „ 1852 - - | 254 | $39\frac{118}{366}$ | $1\frac{69}{366}$ | 17 | 6 | 3 | 1 | 20 | 7 | — |
| „ 1853 - - | 169 | $25\frac{64}{365}$ | $0\frac{224}{365}$ | 7 | 1 | 3 | — | 10 | 1 | — |
| „ 1854 - - | 155 | $24\frac{299}{365}$ | $0\frac{196}{365}$ | 14 | 4 | 1 | 1 | 15 | 5 | — |
| „ 1855 - - | 109 | 18 | $0\frac{244}{365}$ | 20 | 5 | — | — | 20 | 5 | — |
| „ 1856 - - | 211 | $30\frac{362}{366}$ | $0\frac{232}{366}$ | 22 | 1 | — | — | 22 | 1 | Healthy condition of the prisoners very satisfactory. |
| „ 1857 - - | 303 | 39 | $1\frac{104}{365}$ | 12 | — | 3 | — | 15 | — | Sanitary state of the prisoners excellent. |
| „ 1858 - - | 223 | $29\frac{99}{365}$ | $0\frac{141}{365}$ | 8 | 3 | 6 | 2 | 14 | 5 | Sanitary condition of the prisoners extremely good. |
| „ 1859 - - | 265 | $39\frac{26}{365}$ | $0\frac{317}{365}$ | 17 | 2 | 6 | 1 | 23 | 3 | Sanitary state of the prisoners excellent. |
| „ 1860 - - | 254 | $36\frac{277}{366}$ | $0\frac{258}{366}$ | 16 | 3 | 6 | 3 | 22 | 6 | Sanitary condition of the prisoners good. |
| From 1st January to 30th September 1861. | 237 | 49 | $0\frac{48}{91}$ | 9 | 1 | 4 | 1 | 13 | 2 | General health of the prisoners good. (In quarterly reports.) |
| Average during the above period - - - - | 222 | 33 | 1·02 | | | Average - | | 24 | 4·6 | |

Principal Medical Officer's Office,
Corfu, 31st October 1861.

F. WM. INNES, M.D.,
Deputy Inspector General of Hospitals.

## No. 10.

TABLE showing the NUMBER of MEN in the BARRACKS of CORFU and VIDO for every 50 CUBIC FEET of CONTENTS, from 200 to above 600, and for every 10 SUPERFICIAL FEET of FLOOR SPACE, from 20 to 60.

| Name of Barrack. | Cubic Feet. | | | | | | | | | Superficial Feet. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 200 to 250. | 250 to 300. | 300 to 350. | 350 to 400. | 400 to 450. | 450 to 500. | 500 to 550. | 550 to 600. | Above 600. | 20 to 30. | 30 to 40. | 40 to 50. | 50 to 60. |
| | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. | No. of Men. |
| Old Venetian A. - - | — | — | — | — | 154 | — | — | — | — | — | 118 | 36 | — |
| Old Venetian B. - - | 36 | — | 140 | 221 | 179 | — | — | 94 | 156 | 36 | 376 | 164 | 250 |
| Bomb-proof - - - | — | — | — | 624 | — | — | — | — | — | — | 624 | — | — |
| Lower Fort Neuf - - | — | — | — | — | — | 184 | 80 | — | — | — | 96 | 168 | — |
| Upper Fort Neuf - - | — | 80 | — | 80 | — | — | — | — | — | 80 | 80 | — | — |
| Fort Abraham - - - | — | — | — | — | — | — | — | — | 56 | — | — | 56 | — |
| Fort St. George, Vido - | 252 | — | — | — | — | — | — | — | — | 252 | — | — | — |
| Lunette - - - | — | — | — | — | — | 130 | — | — | — | — | — | 130 | — |
| Maitland Tower - - | — | — | — | — | 28 | — | — | — | — | — | — | 28 | — |
| Total - - - | 288 | 80 | 140 | 925 | 361 | 314 | 80 | 94 | 212 | 368 | 1.294 | 582 | 250 |

## No. 11.

STATEMENT of SUMS paid for WATER SUPPLIED to Her MAJESTY'S TROOPS in the under-mentioned Islands during the Year ended 31st December 1856.

| 1856. | Paxo. | | | Sta. Maura. | | | Cephalonia. | | | Ithaca. | | | Zante. | | | Cerigo. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantity. | Rate. | Amount. | Quantity. | Rate. | Amount. | Quantity. | Rate. | Amount. | Quantity. | Rate. | Amount. | Quantity. | Rate. | Amount. | Quantity. | Rate. | Amount. |
| | | | £ s. d. | | | £ s. d. | Gallons. | per 100 Gallons. s. d. | £ s. d. | Gallons. | per 100 Gallons. s. d. | £ s. d. | Gallons. | per 100 Gallons. s. d. | £ s. d. | Gallons. | per 100 Gallons. s. d | £ s. d. |
| January | — | — | | — | Per Month. | 0 16 0 | 34,410 | 0 3 | 4 6 0 | 3,844 | 0 8 | 1 5 7 | 1,860 | 1 0 | 0 18 7 | — | — | — |
| February | From 8th February to 29th June, 1,287 Barrels. | 1d. per Barrel. | | — | | 0 16 0 | 32,190 | — | 4 0 5 | 3,596 | — | 1 3 11 | 1,740 | — | 0 17 5 | — | — | — |
| March | | | | — | | 0 16 0 | 37,260 | — | 4 13 2 | 3,844 | — | 1 5 7 | 1,860 | — | 0 18 7 | — | — | — |
| April | | | 5 7 3 | — | | 0 15 0 | 50,400 | 0 2½ | 5 5 0 | 3,858 | — | 1 5 9 | 1,800 | 0 6 | 0 9 0 | — | — | — |
| May | | | | — | | 0 15 0 | 80,836 | — | 8 8 5 | 4,030 | — | 1 6 10 | 24,954<br>1,080 | 1 0<br>0 6 | 12 14 11 | — | — | — |
| June | | | | — | | 0 15 0 | 75,900 | — | 7 18 1 | 3,900 | — | 1 6 0 | 26,460<br>1,800 | 1 0<br>0 6 | 13 13 7 | — | — | — |
| July | From 30th June to 15th Nov., 4,191 Barrels. | 5 3/10 d. per Barrel. | | — | | 0 15 0 | 78,430 | — | 8 3 5 | 4,030 | — | 1 6 10 | 30,876<br>1,860 | 1 0<br>0 6 | 15 18 0 | — | — | — |
| August | | | 92 11 0 | — | | 0 15 0 | 83,080 | — | 8 13 0 | 4,018 | 0 5½ | 0 18 5 | 28,006<br>1,080 | 1 0<br>0 6 | 14 5 5 | 990 | 1 6 | 0 14 10 |
| September | | | | — | | 0 15 0 | 80,400 | — | 8 7 6 | 3,720 | — | 0 17 0 | 24,984 | 1 0 | 12 9 10 | 3,300 | — | 2 9 6 |
| October | | | | — | | 0 15 0 | 83,080 | — | 8 13 0 | 3,976 | — | 0 18 2 | 21,584<br>1,160 | 1 0<br>0 6 | 11 1 7 | 3,410 | — | 2 11 1 |
| November | From 16th Nov. to 20th Dec., 1,050 Barrels. | 1d. per Barrel. | | — | | 0 15 0 | 80,400 | — | 8 7 6 | 3,900 | — | 0 17 10 | 19,500<br>1,800 | 1 0<br>0 6 | 10 4 0 | 3,300 | — | 2 9 6 |
| December | | | 4 7 6 | — | | 0 15 0 | 36,580 | — | 3 16 2 | 4,030 | — | 0 18 5 | 1,860 | 0 6 | 0 9 4 | 3,410 | — | 2 11 2 |
| | Total - | - - | £102 5 9 | Total - | - - | £ 9 3 0 | Total - | - - | £80 11 8 | Total - | - - | £13 10 4 | Total - | - - | £94 0 3 | Total - | - - | £10 16 1 |

RECAPITULATION - -

| | £ | s. | d. |
|---|---|---|---|
| Paxo - - - | 102 | 5 | 9 |
| Sta. Maura - - | 9 | 3 | 0 |
| Cephalonia - - | 80 | 11 | 8 |
| Ithaca - - - | 13 | 10 | 4 |
| Zante - - - | 94 | 0 | 3 |
| Cerigo - - - | 10 | 16 | 1 |
| Total - - £ | 310 | 7 | 1 |

Commissariat, Ionian Islands,
Corfu, 11th March 1857.

KEAN OSBORN,
Assistant Commissary-General.

No. 12.

TABLE OF MORTALITY at Santa Maura. Five Years from 1st January 1856 to 31st December 1860.

| Diseases. | 1856. | | 1857. | | 1858. | | 1859. | | 1860. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. | Males. | Females. |
| Owing to the total want of medical men in the country, the undersigned cannot give a detailed account of the fatal diseases. But the most prevalent are remitting and intermitting fevers, caused by the several marshes that are about the country, inflammations of the thorax and abdomen, tubercles of the lungs, marasmus among children. | 230 | 206 | 216 | 207 | 211 | 182 | 169 | 141 | 175 | 207 |
| Population - - - | 10,569 | 9,314 | 10,617 | 9,459 | 10,658 | 9,470 | 10,769 | 9,581 | 10,880 | 9,692 |

N.B.—This amount of population has been taken from the statistics of the Regent's office. But the Medical Board of Health, that got registered the population of last year (1860), found that the number of inhabitants of this island amounted to 21,000, viz., 10,992 males, and 10,008 females.

DR. G. CAVADIA, Protomedico.

Visto, E. F. BARR, Director of Health.

Sta. Maura, the 4th December 1861.

DISEASES and MORTALITY in the CIVIL HOSPITAL at AMAXECHI, SANTA MAURA, during Five Years, from 1856 to 1860.

| Diseases. | Males. | | Females. | |
|---|---|---|---|---|
| | Admissions. | Deaths. | Admissions. | Deaths. |
| Adynamia | 2 | — | — | — |
| Apostema | 5 | — | — | — |
| Arthritis | 4 | 1 | 1 | — |
| Amaurosis | 2 | — | 1 | — |
| Apoplexia | 2 | 2 | 2 | 2 |
| Asthma | 1 | 1 | — | — |
| Atrophia | — | — | 1 | 1 |
| Angina tonsillaris | 1 | — | 1 | — |
| Ascites | 1 | 1 | 1 | — |
| Amblyopia | 1 | — | 1 | — |
| Blennorrhagia | 5 | — | 13 | — |
| Bronchitis | 32 | 1 | 2 | — |
| Bronchopneumonia | 1 | 1 | — | — |
| Carcinoma | 1 | — | — | — |
| Combustio | 1 | — | — | — |
| Contusio | 5 | — | — | — |
| Cachexia | 14 | 2 | — | — |
| Cataracta | 1 | — | — | — |
| Contractura | — | — | 1 | — |
| Commotio cerebri | 2 | — | — | — |
| Dementia | — | — | 4 | — |
| Diarrhœa | 7 | 4 | — | — |
| Dysenteria | 2 | — | — | — |
| Epilepsia | 3 | — | 2 | — |
| Emphysema pulmonum | 1 | 1 | — | — |
| Encephalopathia | 3 | — | — | — |
| Enteralgia | 1 | — | — | — |
| Enteritis chronica | 1 | 1 | — | — |
| Eczema | 3 | — | — | — |
| Erysipelas | 4 | 1 | — | — |
| Favus | 3 | — | — | — |
| Febris intermittens | 70 | — | 5 | — |
| „ gastrica | 46 | 1 | 3 | — |
| „ rheumatica | 21 | — | — | — |
| „ typhosa | 11 | — | 1 | — |
| „ biliosa | 5 | 1 | 1 | — |
| „ nervosa | 1 | — | — | — |
| „ remittens | 2 | — | — | — |
| „ intermittens perniciosa | 1 | 1 | — | — |
| Gastralgia | 2 | 1 | — | — |
| Hernia | 4 | — | — | — |
| Hypertrophia hepatis | 7 | — | — | — |
| Hemicrania | 1 | — | — | — |
| Hemiplegia | 2 | — | — | — |
| Leucophlegmasia | — | — | 1 | — |
| Marasmus | 2 | 1 | 2 | 2 |
| Morsus | 1 | — | — | — |
| Febris puerperalis | — | — | 2 | — |
| Necrosis | 3 | — | — | — |
| Nephritis | 3 | 1 | — | — |
| Meningitis | 2 | 2 | — | — |
| Lupus | 2 | — | 1 | — |
| Ophthalmia | 2 | — | — | — |
| Otitis | 1 | — | — | — |
| Neuralgia | 1 | — | — | — |
| Orchitis | 2 | — | — | — |
| Pleurodynia | 2 | — | — | — |
| Peripneumonia | 7 | 2 | — | — |
| Phthisis laryngea | 1 | 1 | — | — |
| Phlegmon | 1 | — | — | — |
| Parotitis | 2 | — | — | — |
| Paronychiasis | 1 | — | — | — |
| Pterygion | 1 | — | — | — |
| Pleuritis | 4 | — | 2 | — |
| Rheumatismus | 14 | — | 1 | — |
| Scabies | 4 | — | — | — |
| Syphilis | 7 | 2 | 5 | — |
| Scrophulosis | 1 | — | 2 | 1 |
| Paralysis | 1 | — | — | — |
| Tuberculosis pulmonum | 8 | 3 | 1 | 1 |
| „ oss. tibiæ | 1 | — | — | — |
| Ulcera | 5 | — | 1 | — |
| Stuprum et consequentia | — | — | 1 | — |
| Vulnus | 27 | — | — | — |
| Hydrocele | 2 | — | — | — |
| Stomatitis | 1 | — | — | — |
| Helmynthiasis | 2 | — | 1 | 1 |
| Odontalgia | 1 | — | — | — |
| Urolithiasis | 1 | — | — | — |
| Pseudoerysipelas | 1 | — | 1 | — |
| Fistula | 1 | — | — | — |
| Carcinoma | 1 | — | — | — |
| Gonnarthrocace | 2 | 1 | — | — |
| Hæmorroides | 1 | — | — | — |
| Total | 395 | 33 | 61 | 8 |

Visto, E. F. BARR, Director of Health.

Dr. G. CAVADIA, Protomedico.

## No. 13.

DISEASES, ADMISSIONS, and DEATHS among the TROOPS at SANTA MAURA for 10 Years, from 1st April 1850 to 31st March 1860.

Average Strength, 120.

| Diseases. | Admitted. | Died. |
|---|---|---|
| Fevers :— | | |
| Intermittent | 113 | 2 |
| Remittent | 30 | 4 |
| Continued | 65 | 2 |
| Typhus | 3 | 2 |
| Eruptive | 2 | — |
| Diarrhœa | 18 | — |
| Dysentery | 9 | 1 |
| Hepatic diseases | 6 | — |
| Rheumatism | 27 | — |
| Phthisis | 5 | 2 |
| Other pulmonary diseases | 66 | — |
| All other diseases | 468 | 2 |

## No. 14.

TWO YEARS METEOROLOGICAL OBSERVATIONS at ITHACA, from 1st January 1857 to 31st December 1859.

| Months. | Thermometric Means. | | | | Winds. | | Days of Sunshine. | Rainy Days. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | 8 A.M. | Noon. | 8 P.M. | Mean of Day. | Direction. | Force. | | | |
| | ° | ° | ° | ° | | | | | |
| January | 55 | 56 | 55 | 55·3 | S.W. | High | 19 | 8 | — |
| February | 53·41 | 55 | 53·52 | 54·4 | W.S.W. | Do. | 23 | 8 | — |
| March | 54·45 | 56 | 54·26 | 55·6 | S.N.W.N. | Moderate | 27 | 8 | Hail. |
| April | 64 | 65 | 64 | 64·3 | S.W. | Do. | 28 | 3 | — |
| May | 70 | 71 | 71 | 70·6 | N.W. | Do. | 27 | 3 | — |
| June | 73 | 74 | 75 | 74 | S.E. | Calm | 24 | — | Lightning. |
| July | 81 | 83 | 81 | 81·6 | N.W. | Do. | 31 | 1 | — |
| August | 84·21 | 83·10 | 84·5 | 84·5 | N.W. | Do. | 28 | — | — |
| September | 74·7 | 76 | 73·2 | 74 | W. | Moderate | 27 | 2 | Thunder. |
| October | 72 | 74 | 72 | 72·6 | N. | Do. | 27 | 2 | Thunder & Lightning. |
| November | 62 | 62·28 | 62·26 | 62·14 | N.E. | Do. | 14 | 3 | — |
| December | 55·28 | 57·14 | 56·10 | 56·17 | N.E. S.E. | High | 19 | 8 | — |

## No. 15.

MORTALITY, ADMISSIONS, and DISEASES among an AVERAGE STRENGTH of 54 MEN at ITHACA, during Seven Years, from April 1853 to December 1859.

| Diseases. | Admitted. | Died. |
|---|---|---|
| Fevers :— | | |
| Intermittent | 24 | — |
| Remittent | 9 | — |
| Continued | 23 | — |
| Diarrhœa | 19 | — |
| Dysentery | 7 | — |
| Hepatic disease | 1 | — |
| Rheumatism | 11 | — |
| Phthisis | 2 | — |
| Other pulmonary diseases | 27 | — |
| All other diseases | 164 | 1 |

## No. 16.

TOTAL DISEASES, ADMISSIONS, and DEATHS among an AVERAGE STRENGTH of 603 MEN in CEPHALONIA, for 10 Years, from 1st April 1850 to 31st March 1860.

| Diseases. | Admitted. | Died. |
|---|---|---|
| Fevers :— | | |
| Intermittent | 612 | — |
| Remittent | 458 | 28 |
| Continued | 2,205 | 27 |
| Typhus, Typhoid, Synochus | 3 | 1 |
| Eruptive | 5 | — |
| Cholera | 61 | 37 |
| Diarrhœa | 656 | 1 |
| Dysentery | 75 | 6 |
| Hepatic diseases | 92 | 1 |
| Rheumatism | 236 | — |
| Phthisis | 27 | 11 |
| Other pulmonary diseases | 454 | 2 |
| All other diseases | 3,937 | 18 |
| Total, 10 Years | 8,821 | 132 |

## No. 17.

STATISTICA MEDICA DELL' ISOLA DI ZANTE.

| Anno. | Popolazione. | | | Nascite. | | | Morti. | | | Differenza fra Nascite e Morti. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maschi. | Femmine. | Totale. | Maschi. | Femmine. | Totale. | Maschi. | Femmine. | Totale. | Più. | Meno. | Nascite più delle Morti. | Nei 5 anni numero medio della popolazione - - |
| 1856 | 20,136 | 17,017 | 37,153 | 400 | 338 | 738 | 514 | 465 | 979 | — | 241 | | " " delle nascite - - |
| 1857 | 19,747 | 17,298 | 37,045 | 709 | 590 | 1,299 | 540 | 523 | 1,063 | 236 | — | | " " delle morti - - |
| 1858 | 19,651 | 17,308 | 36,959 | 693 | 600 | 1,293 | 448 | 441 | 889 | 404 | — | | Onde risulterebbero nascite di più - - |
| 1859 | 20,408 | 17,765 | 38,173 | 758 | 660 | 1,418 | 391 | 375 | 766 | 652 | — | | 37,466 1,210 881 |
| 1860 | 20,236 | 17,767 | 38,003 | 696 | 609 | 1,305 | 359 | 349 | 708 | 597 | — | | |
| — | — | — | — | 3,256 | 2,797 | 6,053 | 2,252 | 2,153 | 4,405 | 1,889 | 241 | 1,648 | |

### OSSERVAZIONE.

1mo. In questi 5 anni le nascite superano le morti di 1,648 individui, per cui la popolazione dovrebbe essere più aumentata di quello che si osserva in questo quadro, ma non lo è atteso l'emigrazione nel prossimo continente Greco.

2do. Nella città, abitata da 15 mila individui, morirono negli ultimi 5 anni 2,230, e nella campagna abitata da quasi 23 mila individui, morirono 2,175. In tutta l'isola, la mortalità fu di 2¼ ℔ °/₀, però in città fu di quasi 3 ℔ °/₀, e nella campagna meno del 2 ℔ °/₀, e questo deve attribuirsi alla maggiore povertà degli abitanti della città, alle arti, e mestieri che professano, ai vizj, ed alla mal' aria di alcune situazioni della città.

Ogni anno secondo i registri sanitarj si vaccinano in città ed in campagna più di 1,000 bambini, e la vaccinazione viene mantenuta, più o meno, in tutto l'anno.

### MALATTIE DOMINANTI.

Febbri gastriche, e gastriche biliose, intermittenti e remittenti, che spesso prendono il carattere di perniciose, e febbri tifoidi. Queste malattie sono più frequenti nell' estate, e di autuno, e quando la primavera è piovosa, desse prendono talvolta un carattere epidemico. Attacano specialmente li abitanti delle due estremità della città, e cio si attribuisce alle acque stagnanti che esistono presso l'estremità meridionale alle colline esistenti presso alla parte settentrionale che impediscono il libero movimento dell' aria, ed alla povertà degli abitanti delle due suddette situazioni. Si osservano pure tali malattie in campagna, in quelle situazioni ove esistono acque stagnanti. Oltre le suddette malattie, si osservano pure malattie flogistiche, come per esempio bronchiti, pneumoniti, disenterie, diarée, reumatismi acuti. Talvolta si osservano sporadicamente, od in istato di epidemia, febbri esantimatiche, e l'angina dif-

terica, che solo da pochi anni si osservò nel paese con carattere epidemico, si presenta tutt' ora sporadicamente: spesso si vedono dei casi di tisi tubercolare, non pero come negli anni antecedenti. Rarissimi sono i casi di croup. Raramente s'incontrano i calcoli della viscica, mentre la renella si osserva più spesso. In qualche villaggio dell' isola si presentano qualche caso di elefantiasis dei Greci.

Da alcuni anni le malattie diminuirono di molto, ed ammigliorò lo stato jgienico del paese, e ciò si deve attribuire alla coltivazione di molti terreni che erano incolti, alla formazione di alcune strade campestri, all' introduzione delle acque nella città, ed in generale al miglior sistema di vita degli abitanti.

Le condizioni jgieniche migliorerebbero di più, ove si prendessero misure per diseccare varj terreni dalle acque stagnanti, e coltivarli; collo scavo del porto che da anno in anno si rende più dannoso alla salute pubblica, colla formazione di nuove strade in certe situazioni che sono ancora incolte, e finalmente nella città con un ammiglioramento delle condizioni jgieniche nell' ospizio dell' ospedale civile.

### Ospedale Civile.

L'Ospedale Civile contiene 40 letti parte dei quali sono occupati da Vecchi Invalidi come per regolamento municipale i rimanenti vennero occupati come segue.

| Anno. | Ammalati Introdotti. | All' Ospedale Morti. | Sortiti. | Malattie Predominanti. |
|---|---|---|---|---|
| 1856 | 76 | 20 | 45 | Sifilide, febbre intermittente, tifoide gastrica. |
| 1857 | 59 | 12 | 42 | Piaghe venéree, tubercoli polmonari, idrope. |
| 1858 | 56 | 18 | 35 | Febbri intermittenti, affezioni reumatiche. |
| 1859 | 46 | 9 | 22 | Affezioni reumatiche scrofolose e piaghe. |
| 1860 | 54 | 11 | 34 | Sifilide, tubercoli, febbri intermittenti. |
| Totale - | 291 | 70 | 178 | |

Direttore di Sanità, e Presidente della Commissione Medica,
J. Jolly.
Spirid Carvella, Protomedico.

Zante, li 8 Novembre 1861.

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## No. 18.

Table of Diseases, Admissions, and Deaths among British Troops serving in Zante between 1st April 1850 and 31st March 1855; also between 21st August 1856 and 31st December 1859. Average Strength during 8 years and 4 months, 394.

| Diseases. | Admitted. | Died. |
|---|---|---|
| Fevers: | | |
| Intermittent - - - | 160 | — |
| Remittent - - - - | 28 | 1 |
| Continued - - - - | 763 | 13 |
| Typhus - - - - | 7 | 2 |
| Eruptive - - - - | 1 | — |
| Diarrhœa - - - - | 413 | — |
| Dysentery - - - | 185 | 3 |
| Hepatic diseases - - - | 33 | — |
| Rheumatism - - - - | 192 | — |
| Phthisis - - - - | 9 | 7 |
| Other pulmonary diseases - - | 260 | 2 |
| All other diseases - - - | 2,146 | 4 |
| Total, 8 years and 4 months - | 4,197 | 32 |

During the period omitted from this return a militia regiment garrisoned Zante. The usual records were not left at the garrison hospital by the troops. A special report, however, remains to show that from 25th October to 21st November cholera raged among the troops in common with the towns-people. 31 admissions are reported, of which 24 ended in death; only seven cases recovered. The disease did not seem to affect castle or town occupants in particular.

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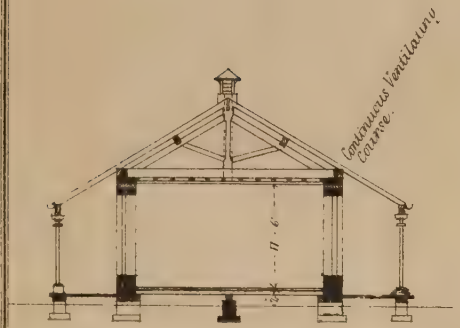
LONDON:
Printed by George E. Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

# BARRACK HUT FOR 24 MEN.

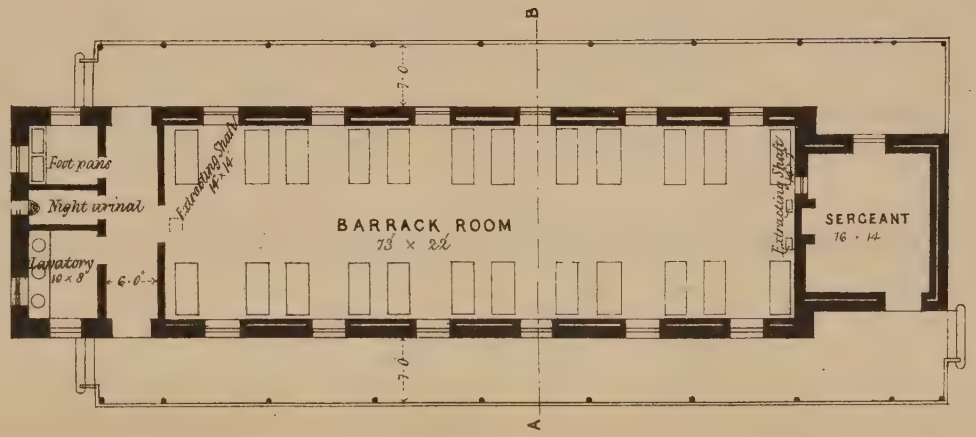
ALLOWING 760 CUBIC FEET PER MAN.

FRONT ELEVATION.

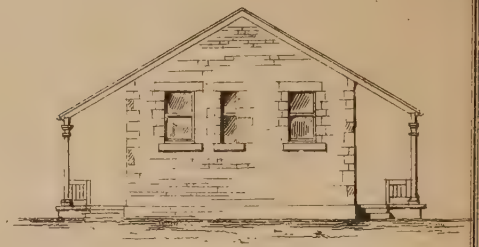
Scale of 10 5 0 10 20 30 40 50 60 Feet.




SECTION ON THE LINE A.B.




PLAN.



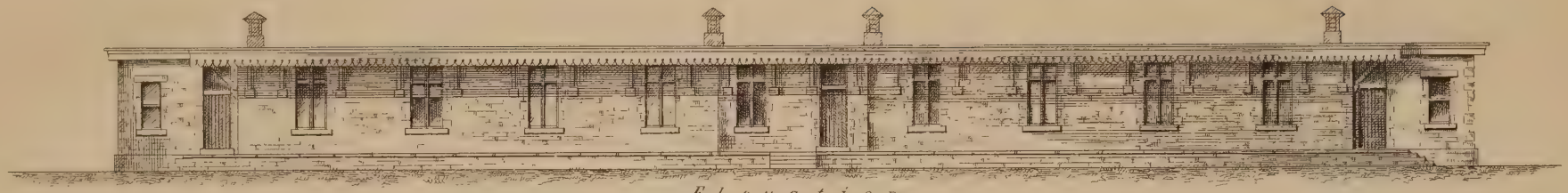
END ELEVATION.

Day & Son Lith.rs to the Queen.

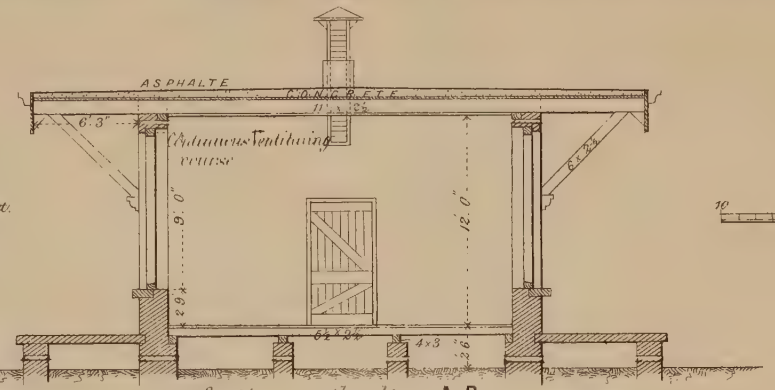
# CERIGO

## PROPOSED BARRACKS.

Plan II.



Elevation




Section on the line A.B.

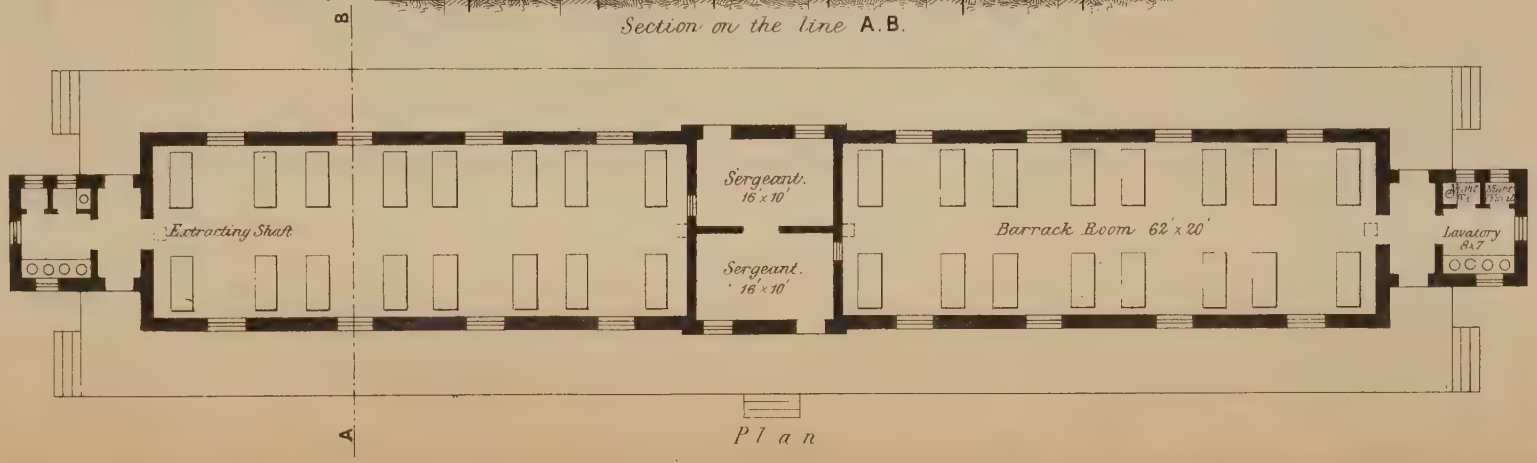
Scale for Plan and Elevations

10 5 0 10 20 30 40 50 feet.

Scale for Section.

10 5 0 10 20 feet

Ventilating course



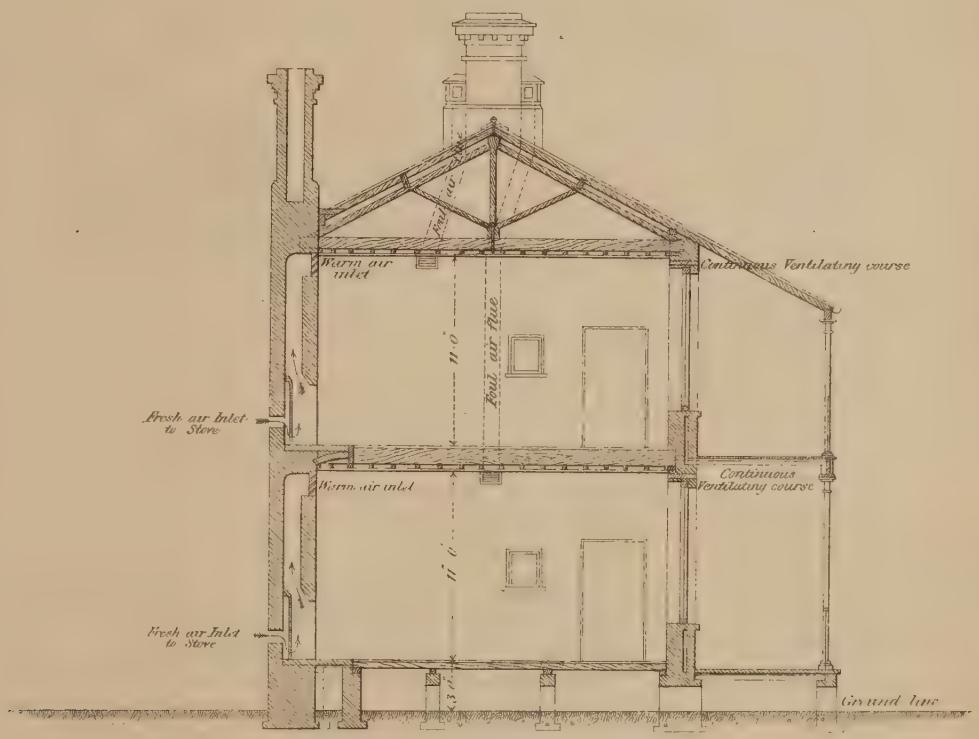

Plan

# SOLDIER'S BARRACKS.

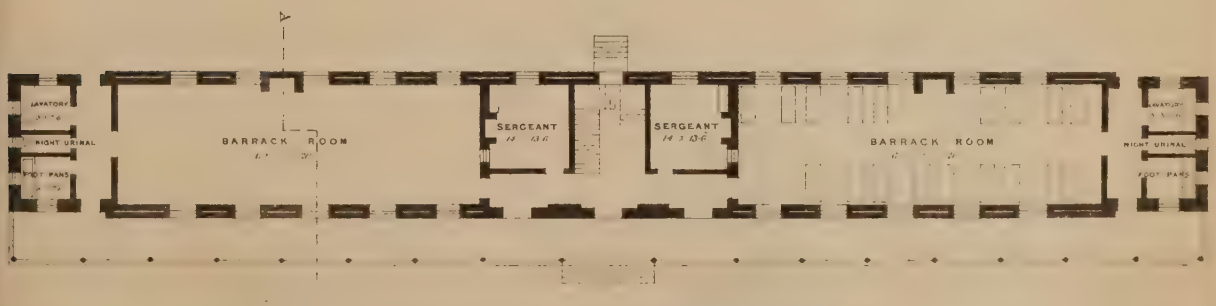
## For 4 N.C.O^s and 72 Men.

*Allowing 730 cubic feet and 70 superficial feet per man.*

ELEVATION




SECTION ON THE LINE AB




PLAN OF GROUND FLOOR

SCALE OF FEET TO PLAN & ELEVATION

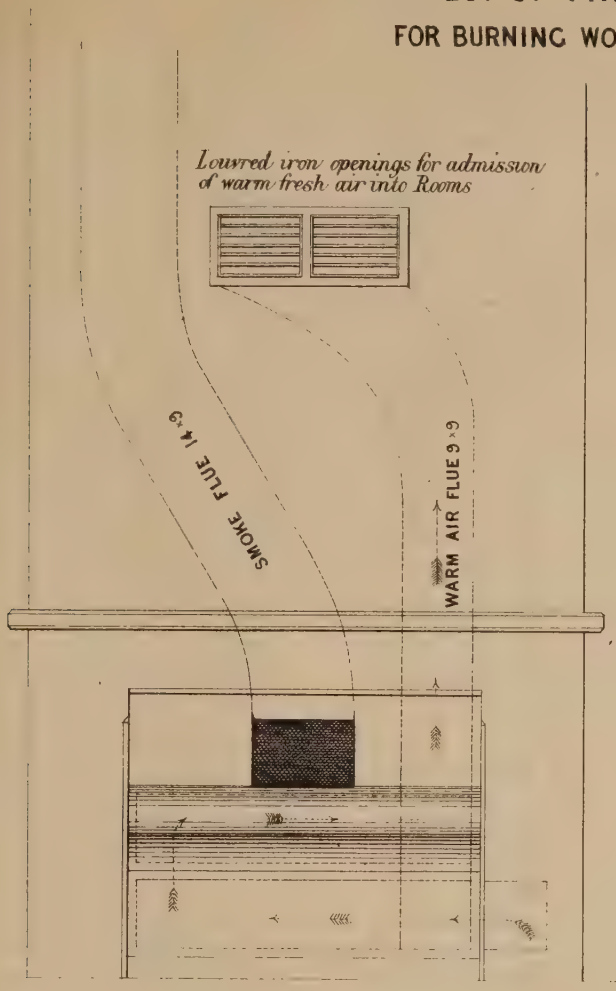
10 5 0 10 20 30 40 50 60 70 80 90

SCALE OF FEET TO SECTION

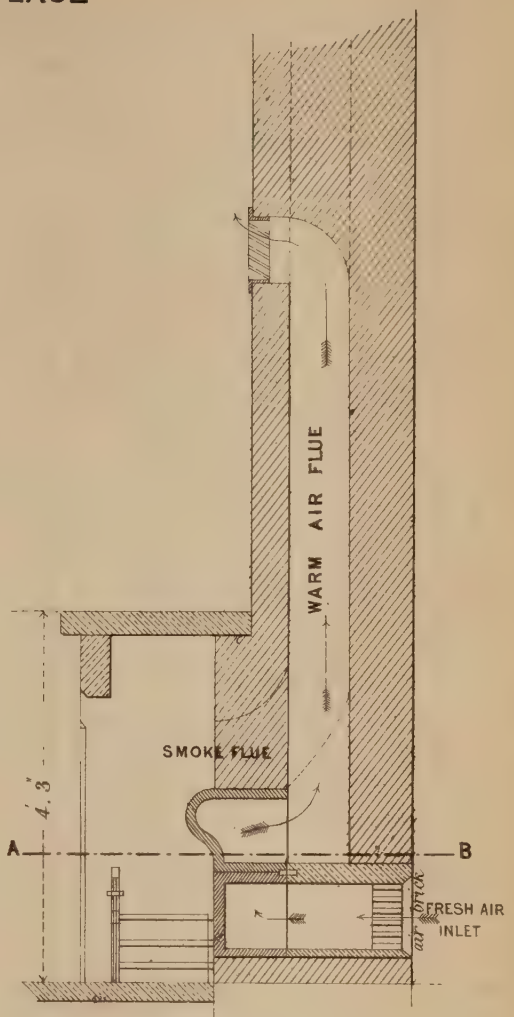
10 5 0 10

# DETAILS. OF FIREPLACE

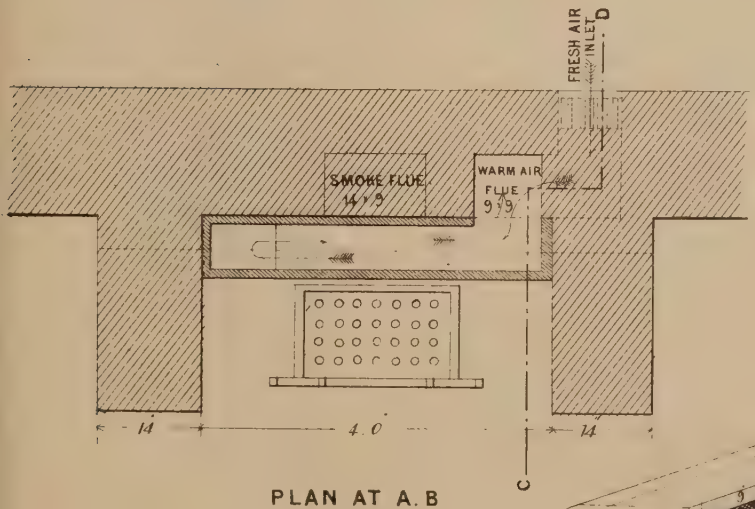
## FOR BURNING WOOD



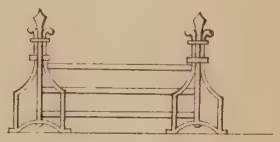

ELEVATION OF FIRE PLACE



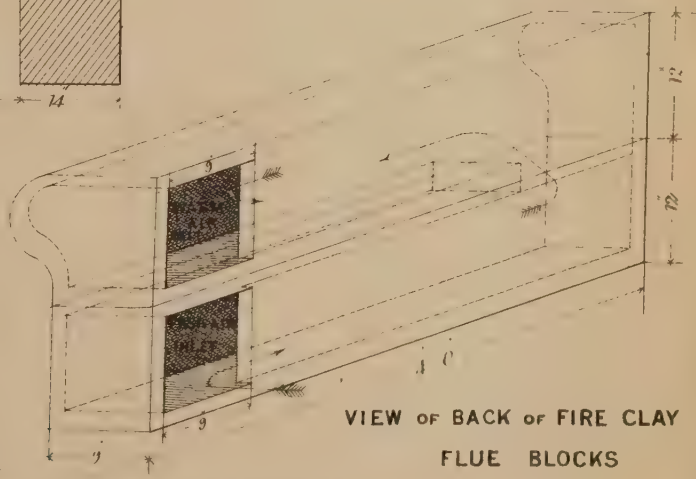

SECTION C.D ON PLAN.




PLAN AT A.B



ELEVATION OF FIRE DOGS



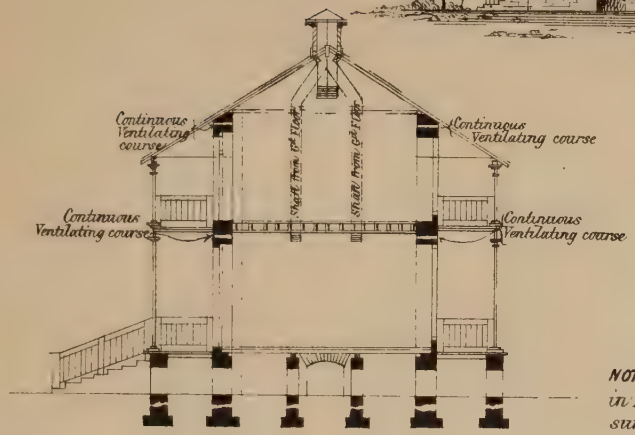

VIEW OF BACK OF FIRE CLAY FLUE BLOCKS

SCALE OF FEET

Day & Son Lith to the Queen

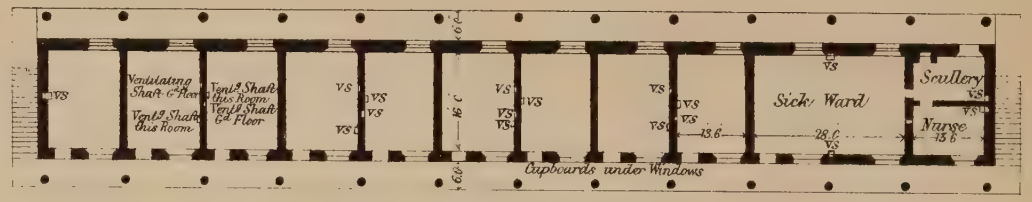
MARRIED SOLDIER'S QUARTERS

END ELEVATION

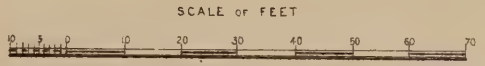


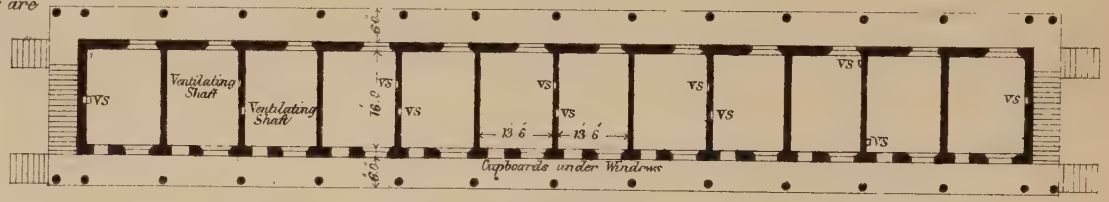

SECTION. A.B

*NOTE One Sick Ward as shewn in First Floor Plan is considerd sufficient when two Blocks are required*



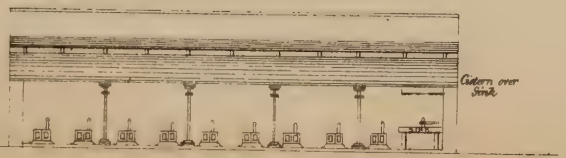

FIRST FLOOR PLAN



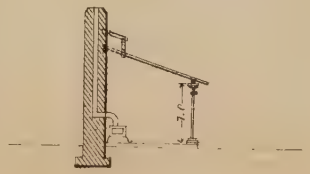




GROUND PLAN

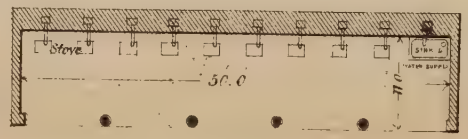
COOK HOUSE



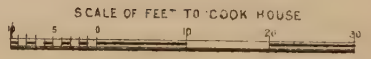

ELEVATION



SECTION AB




PLAN

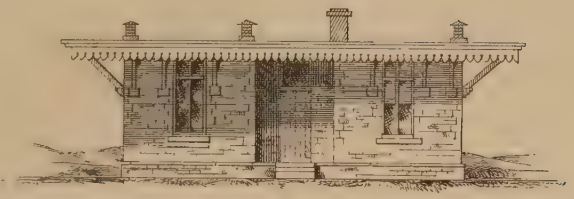


MARRIED SOLDIERS QUARTERS

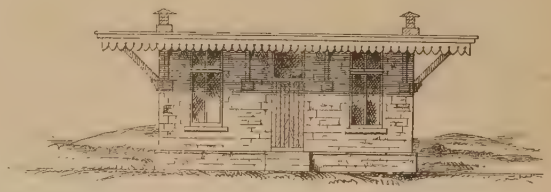
Plan VI.

GUARD HOUSE & CELLS.

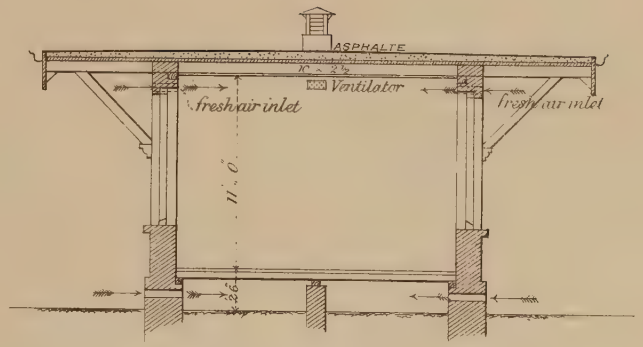
# CERICO



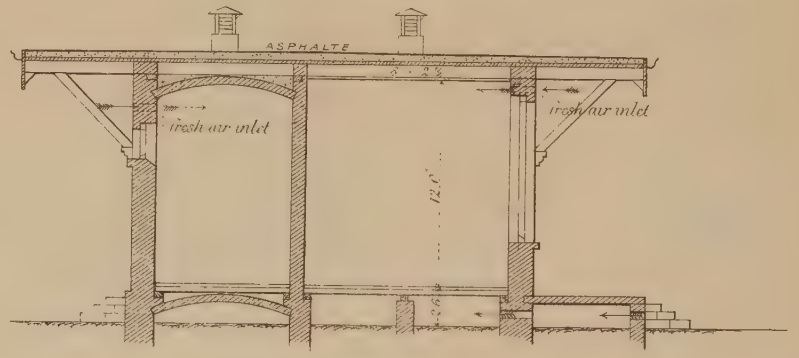
Elevation



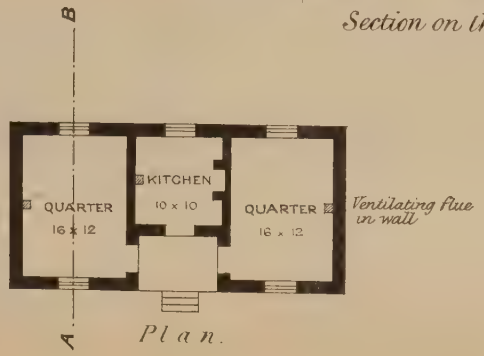
Elevation



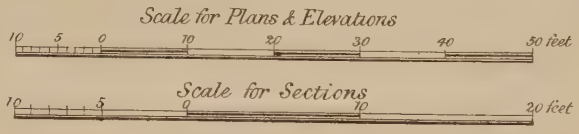

Section on the line A. B.

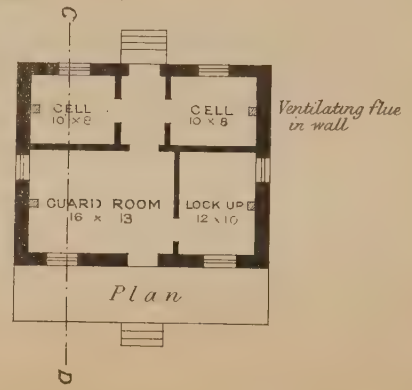



Section on the line C. D.




Plan.



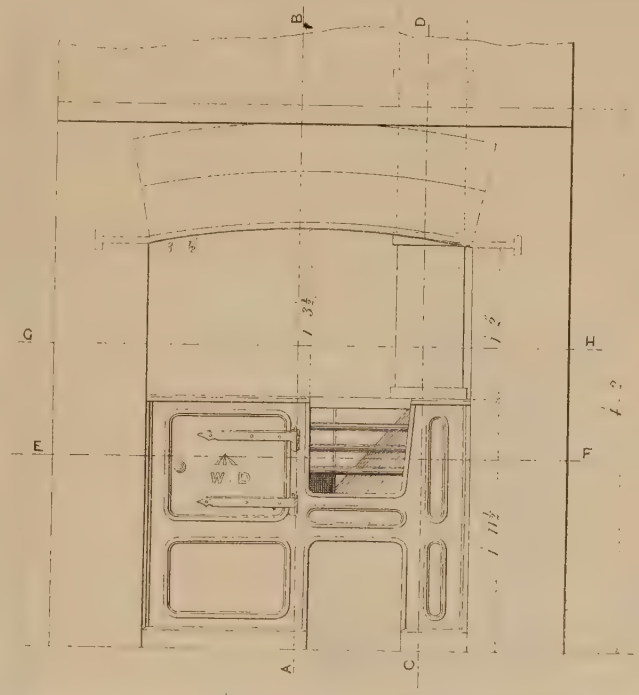

Plan

# RANGE FOR MARRIED SOLDIERS' QUARTERS.

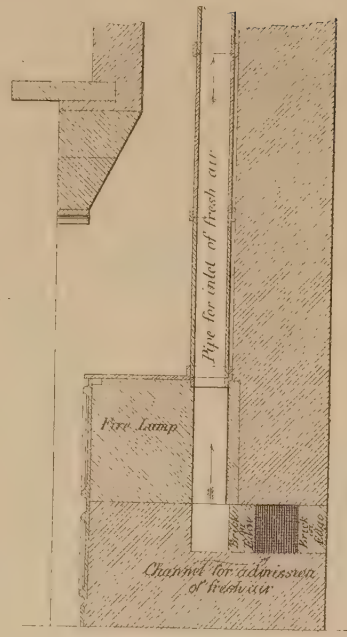
Plan VII.

MADE FOR THE WAR DEPARTMENT BY MESSRS BENHAM, WIGMORE STREET.

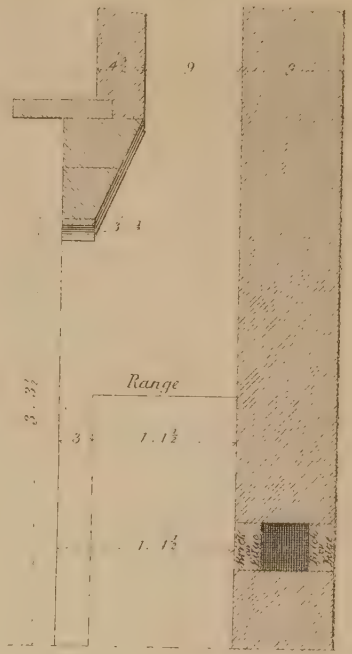
ELEVATION

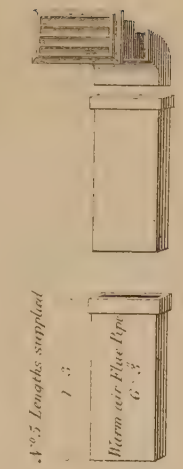



SECTION AT C.D.

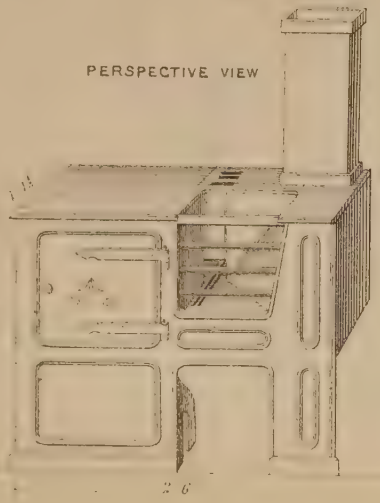



SECTION AT A B

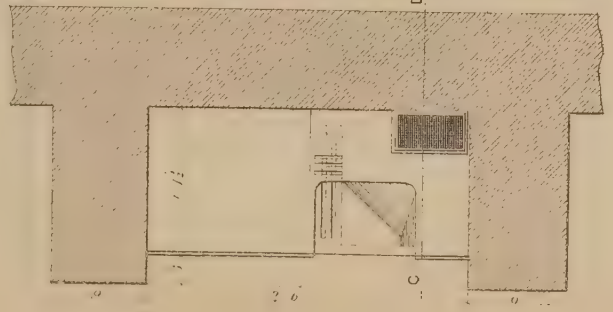


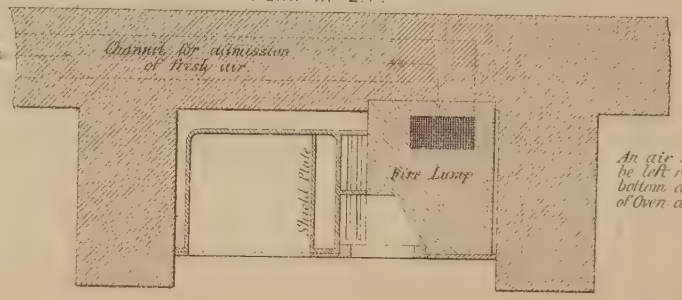

PERSPECTIVE VIEW



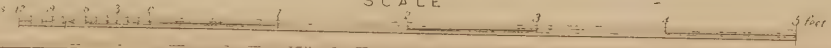
PLAN AT G.H.




PLAN AT E.F.



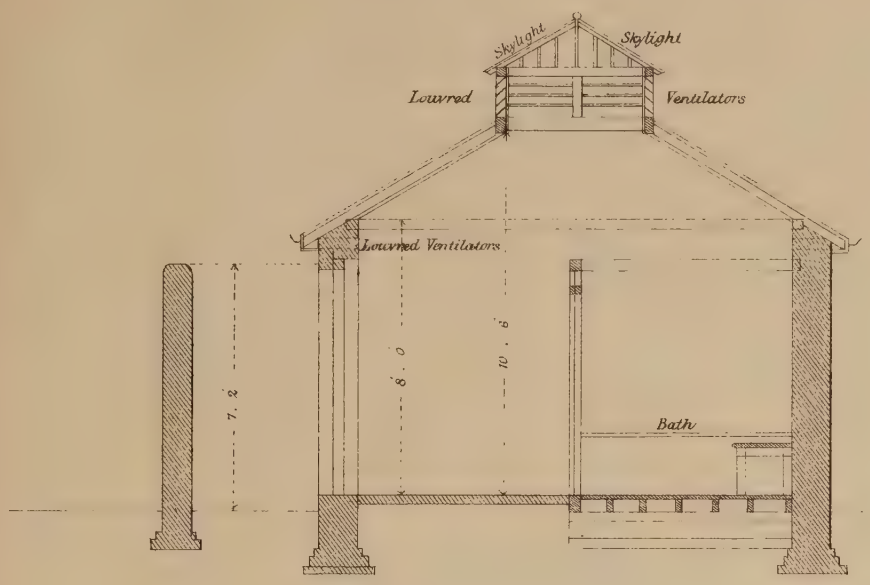

SCALE




Day & Son, Lithrs to the Queen.

# LATRINES ABLUTION ROOMS &c FOR MARRIED SOLDIERS' QUARTERS

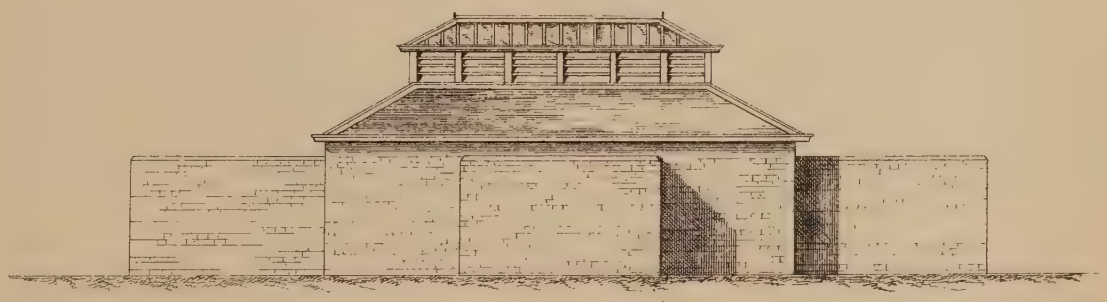




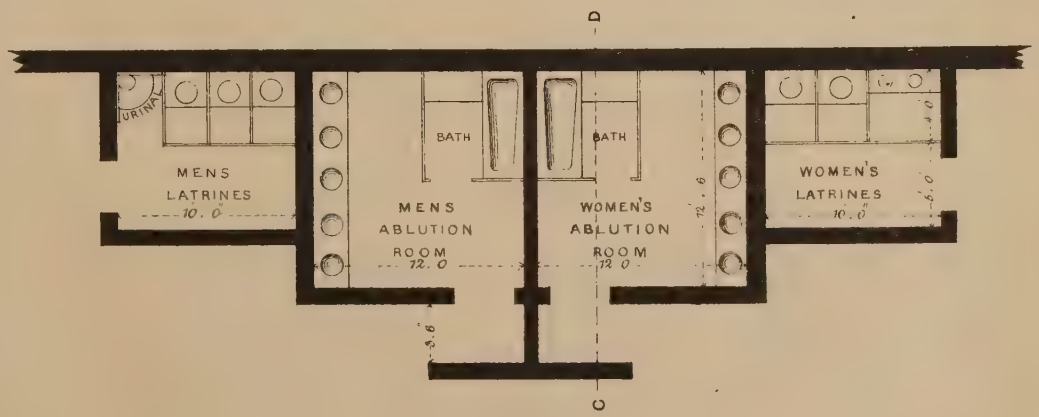

SECTION THRO' C D.

5 4 3 2 1 0 5 10 15 feet

SCALE TO SECTION



ELEVATION



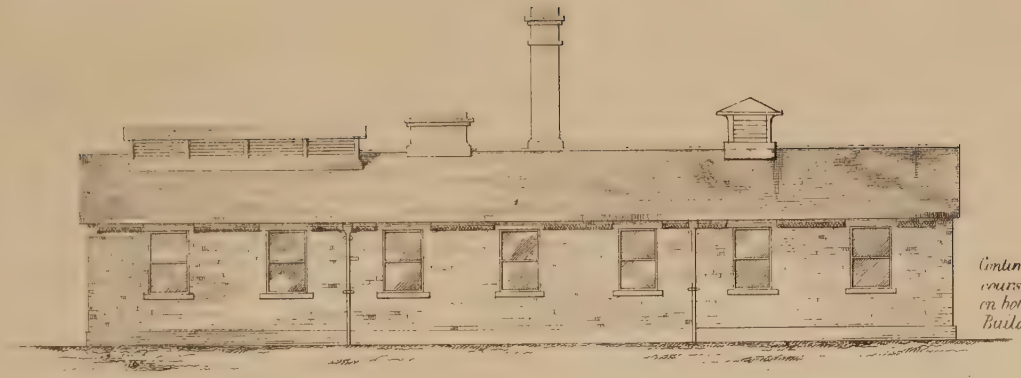

PLAN

SCALE TO PLAN AND SECTION

10 5 0 10 20 30 ft

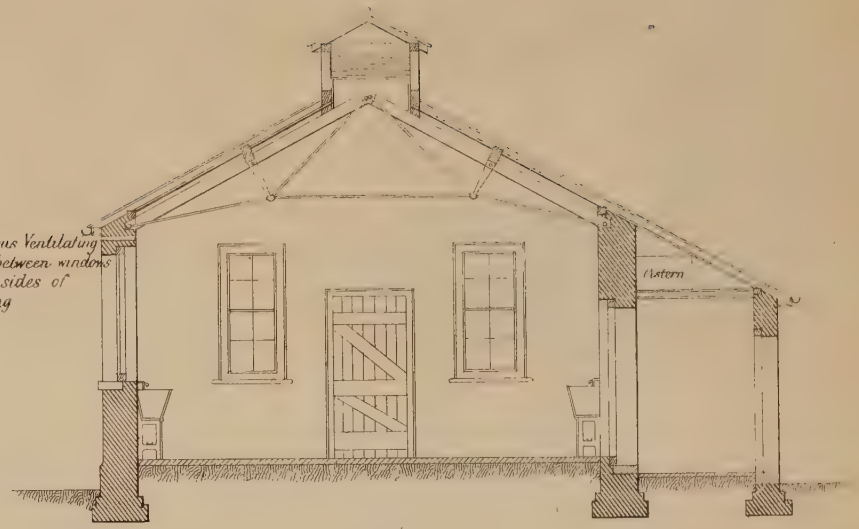
Day & Son. Lith.rs to the Queen

# WASH HOUSE & LAUNDRY.

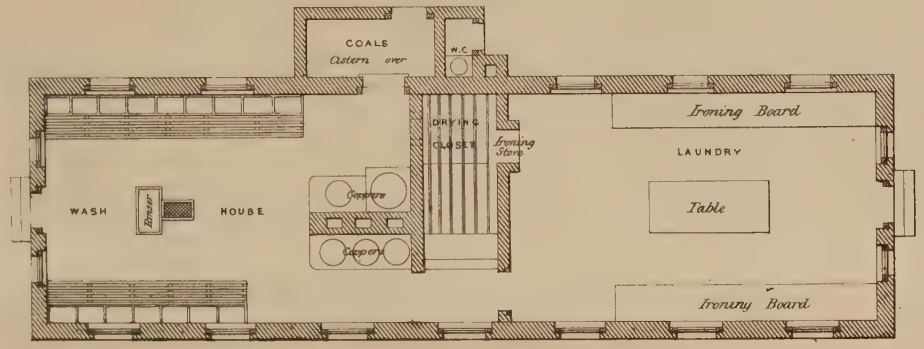


ELEVATION.

*Cold Water only to be laid on to the Washing tubs.*
*The Ironing Stove & Drying Closet to be of the pattern made for the War Department by Mess^rs Jeakes & C^o*




SECTION




PLAN

SCALE OF FEET FOR PLAN AND ELEVATION

10 5 0 10 20 30 40 50

SCALE OF FEET FOR SECTION

5 0 5 10 15 20 25

Day & Son, Lith^rs to the Queen.

# VENTILATING GRATE, FOUL AIR SHAFT &c.



VENTILATING GRATE.
ELEVATION

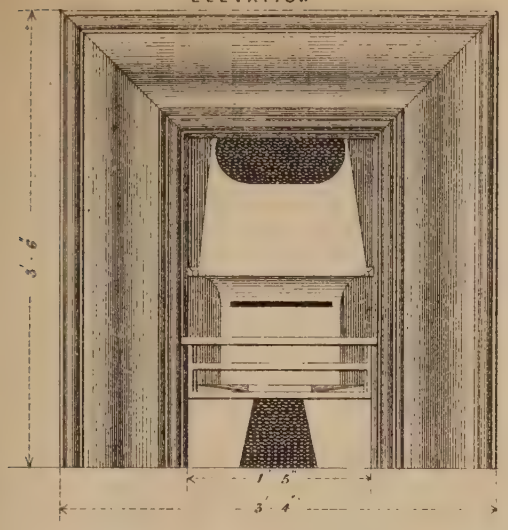
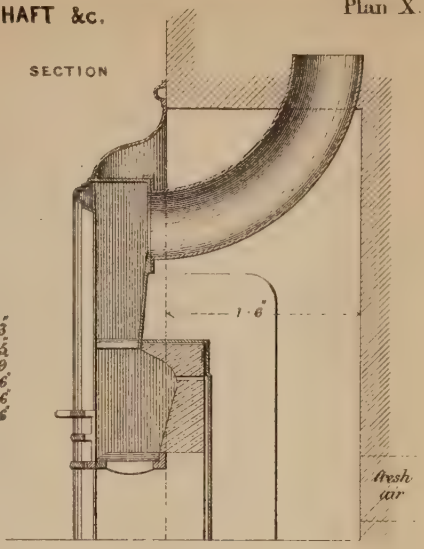


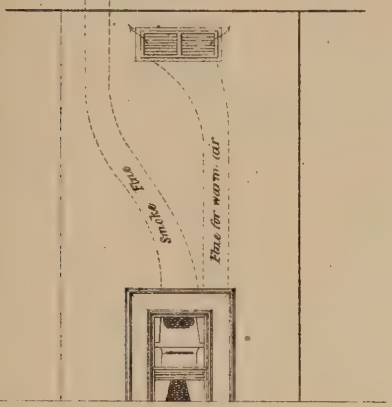

Fig. 1.

SECTION

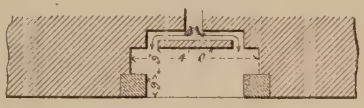



| | | | |
|---|---|---|---|
| *Width of Fire Opening* | | | 1'3" |
| Do | " Do | " | 1'6" |
| Do | " Do | " | 1'9" |
| *Sizes of Stoves* | | | 3'2" x 3'6" |
| Do | " Do | | 3'4" x 3'6" |
| Do | " Do | | 3'8" x 3'6" |

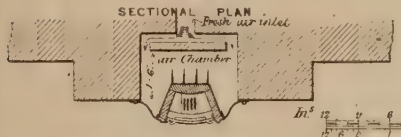
ELEVATION OF CHIMNEY AND STOVE SHEWING THE FLUES



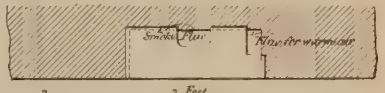

PLAN SHEWING THE METHOD OF FORMING THE AIR CHAMBER IN AN EXISTING 4 FT FIRE PLACE




SECTIONAL PLAN




PLAN OF COVERING STONE FOR AIR CHAMBER



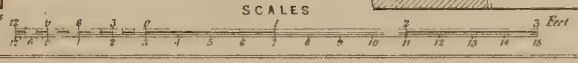
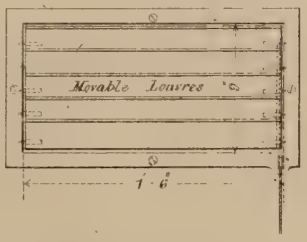
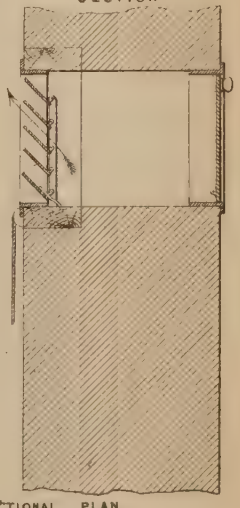

SCALES

INLET FOR FRESH AIR.

Fig. 2.

ELEVATION

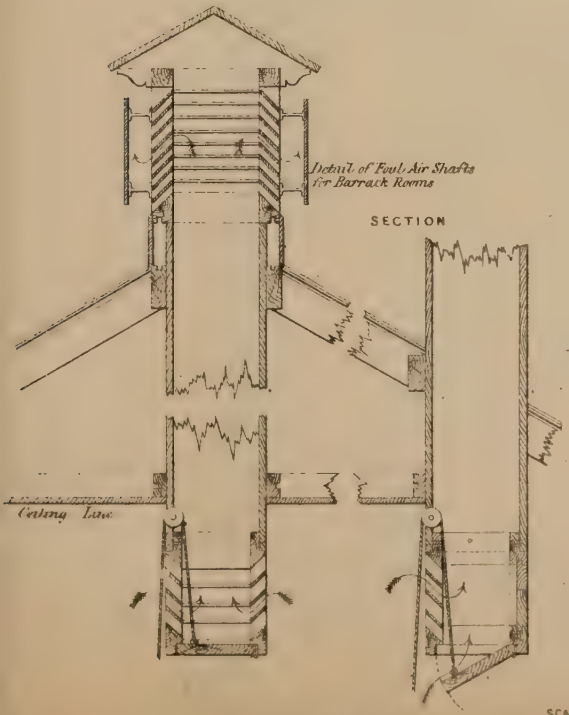



SECTION

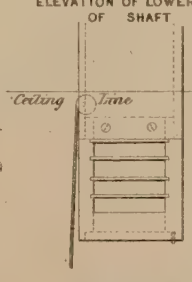


Detail of Foul Air Shafts for Barrack Rooms

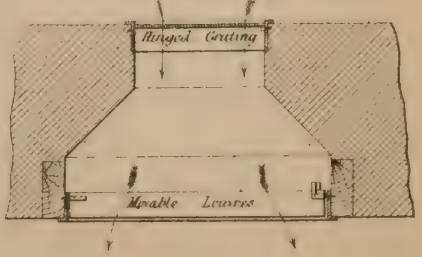
SECTION




ELEVATION OF LOWER END OF SHAFT

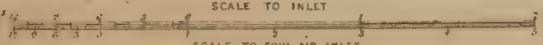



SECTIONAL PLAN




PLAN OF LOUVRE FRAME

SCALE TO INLET

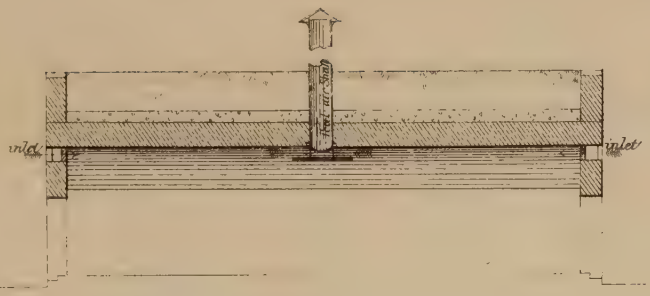



SCALE TO FOUL AIR INLET

Day & Son, Lith.rs to the Queen

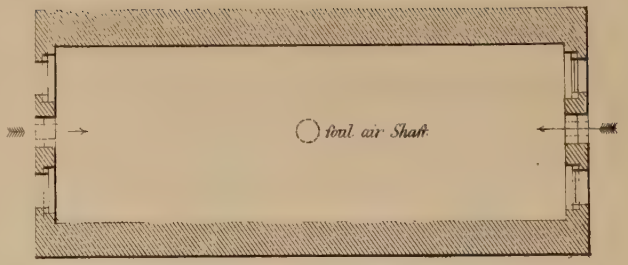
# DIAGRAM SHEWING THE METHODS OF VENTILATION TO CASEMATES

Fig 1.



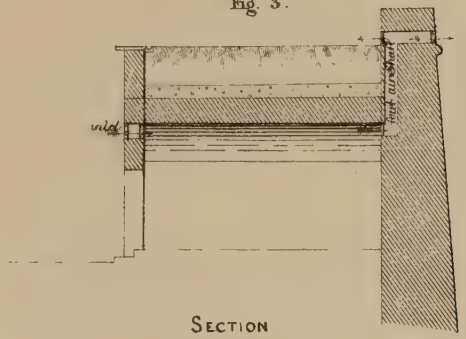

SECTION OF LONG CASEMATE WITH WINDOWS AND DOORS AT OPPOSITE ENDS

Fig. 2.



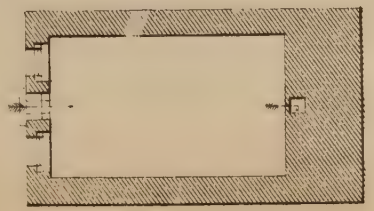

PLAN OF LONG CASEMATE

Fig. 3.



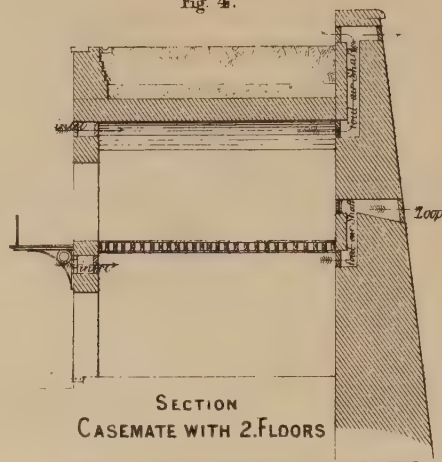

SECTION

CASEMATE WITH ONE END AGAINST DEAD WALL



PLAN

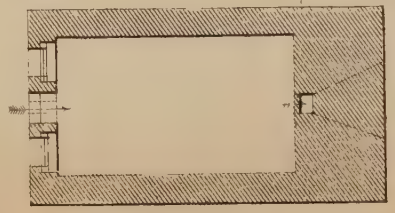
Fig. 4.




*This plan may be adopted in existing casemates where shafts cannot be carried up to the parapet*

SECTION

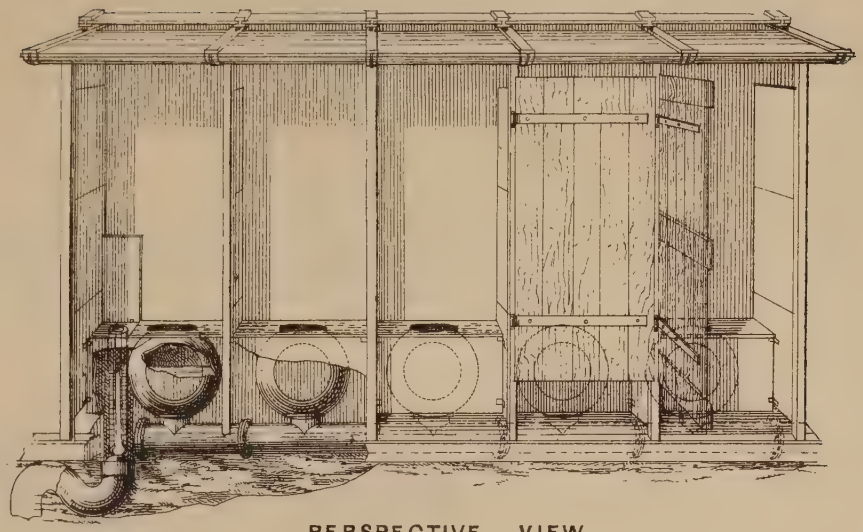
CASEMATE WITH 2. FLOORS



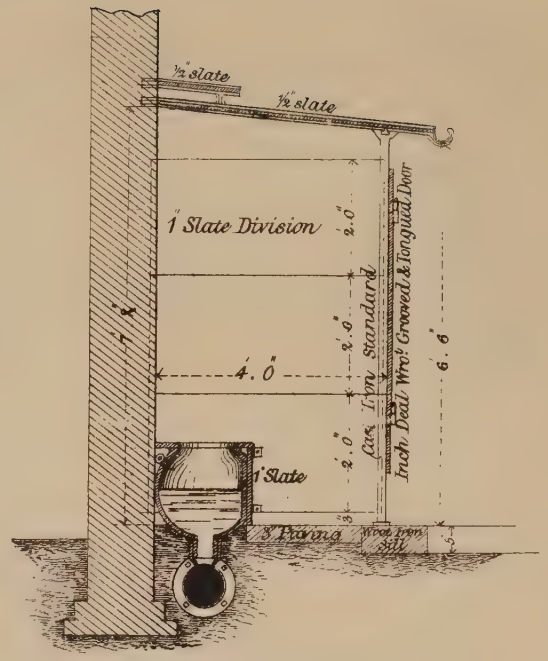
PLAN

# LATRINES

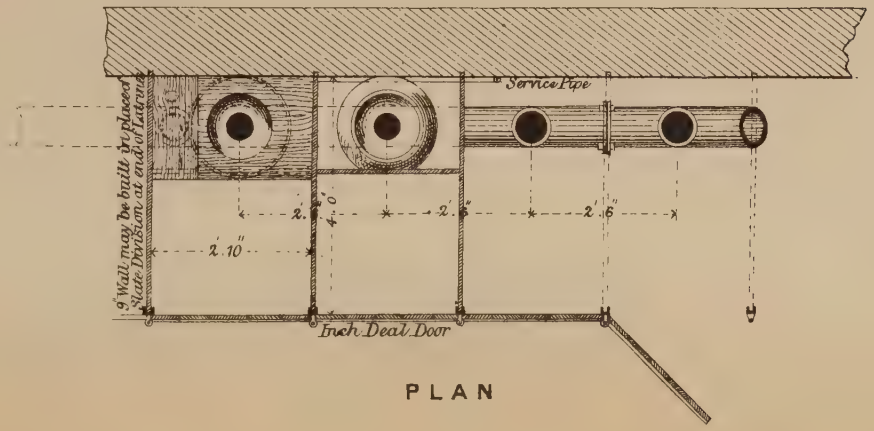
## MANUFACTURED BY GEORGE JENNINGS LAMBETH



PERSPECTIVE VIEW




SECTION




PLAN

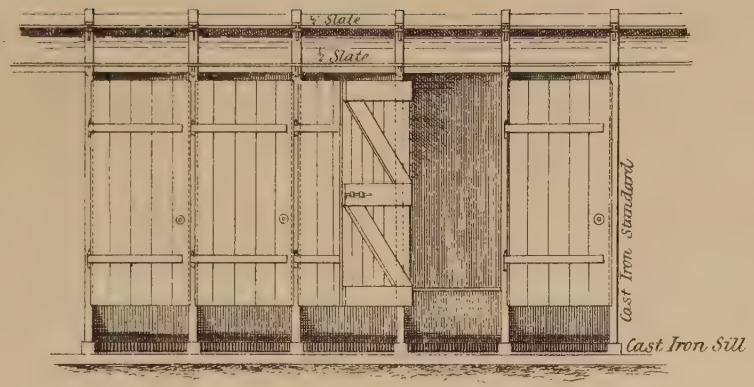
SCALE

INS 12 9 6 3 0 1 2 3 4 5 6 7 8 FEET

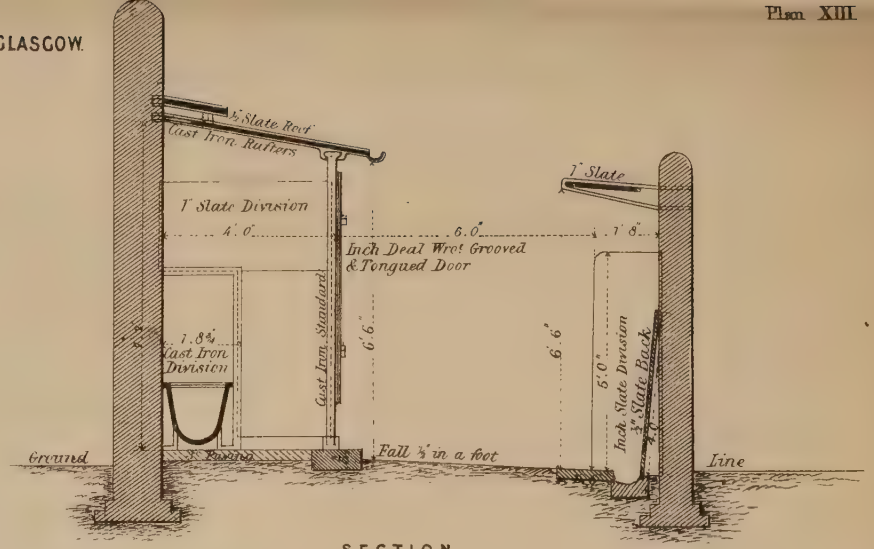
Day & Son, Lith.rs to the Queen

# LATRINES & URINALS.

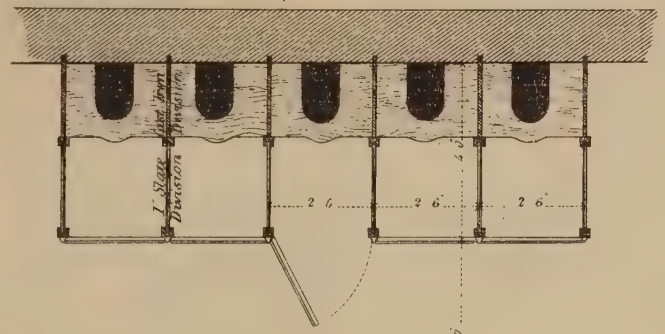
MANUFACTURED BY MACFARLANE & Co, GLASGOW.




ELEVATION.



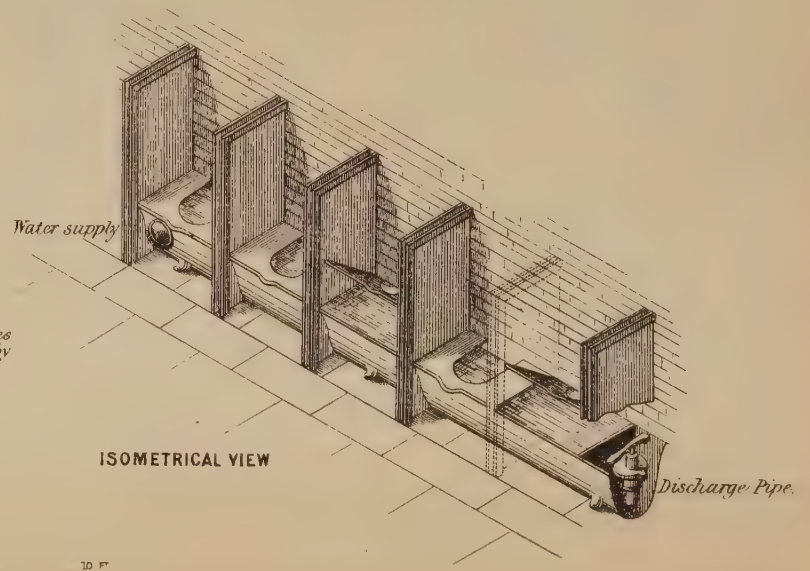

SECTION.




Note, Urinals are not in all cases fixed with Latrines.

PLAN.

Note. The Slate required for Latrines and Urinal is not supplied by Macfarlane & Co.




ISOMETRICAL VIEW

SCALE

INS 1 2 3 4 5 6 7 8 9 10 FT

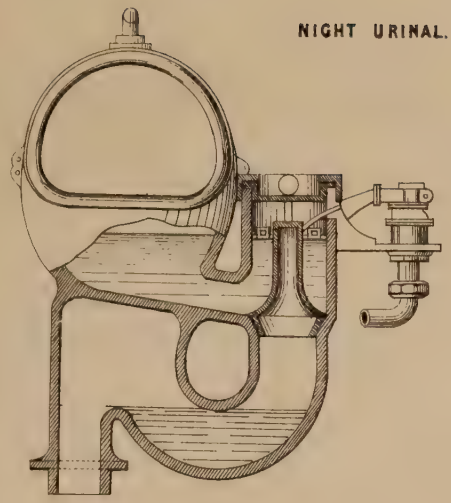
Day & Son Lith.rs to the Queen

# URINALS.

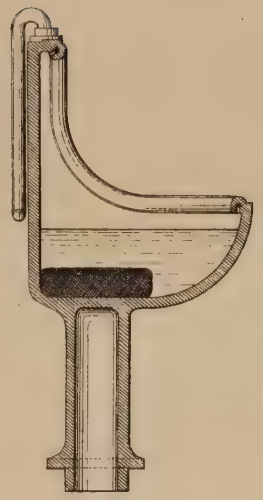
## MANUFACTURED BY GEORGE JENNINGS.

## LONDON.

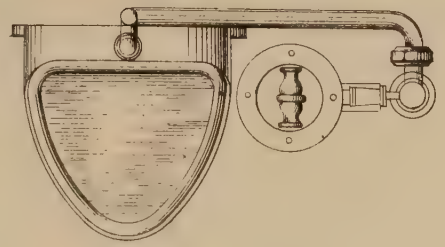
NIGHT URINAL.



FRONT VIEW.

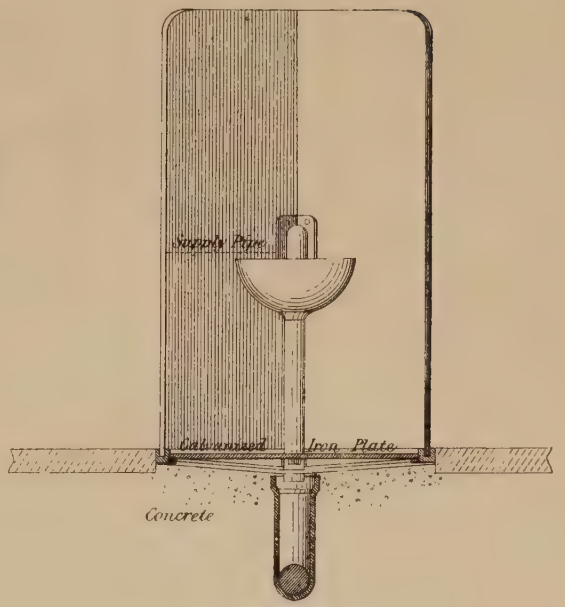


SECTION.

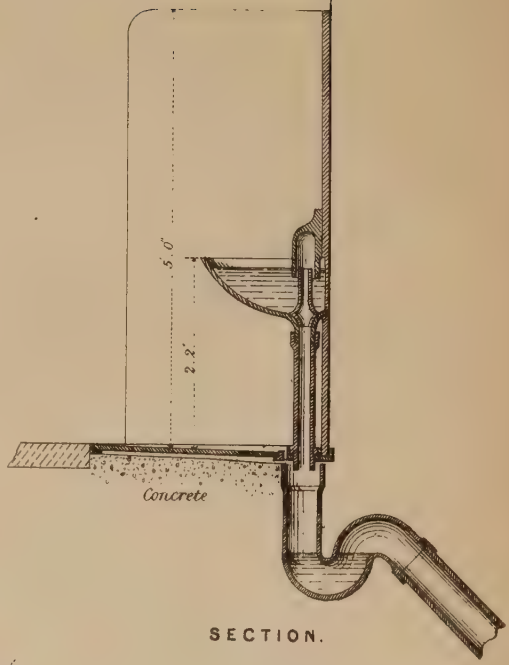


PLAN.

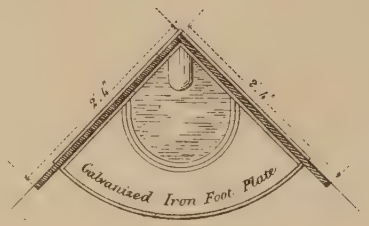
DAY-URINAL.




ELEVATION.




SECTION.




PLAN.

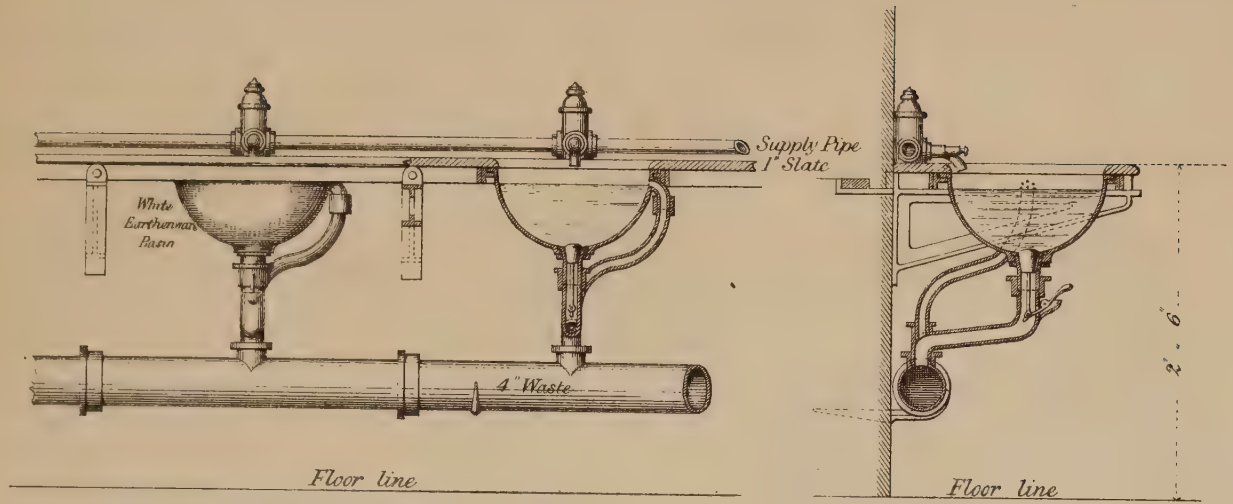
SCALE

INS 12 9 6 3 0 1 2 3 FT

SCALE

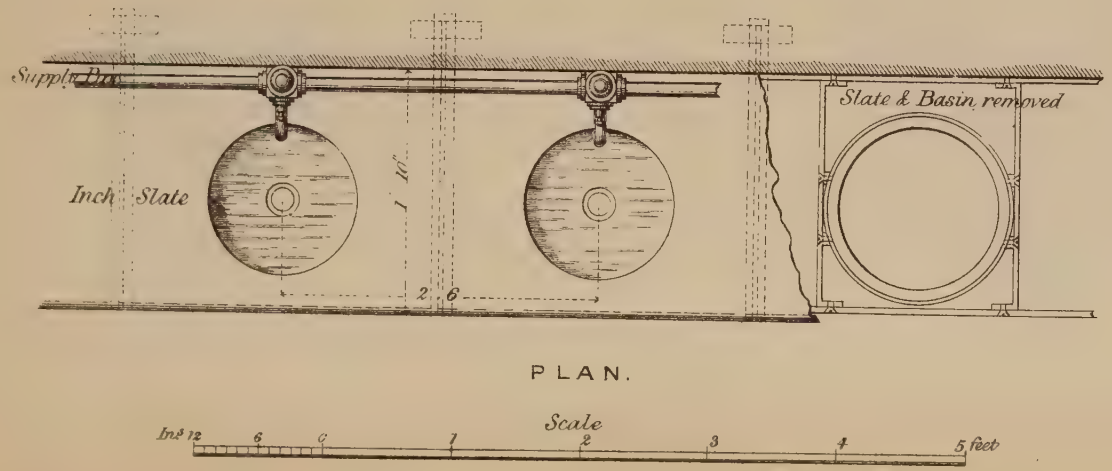
INS 12 9 6 3 0 1 2 3 4 5 6 7FT

# WASHING BASINS




ELEVATION.

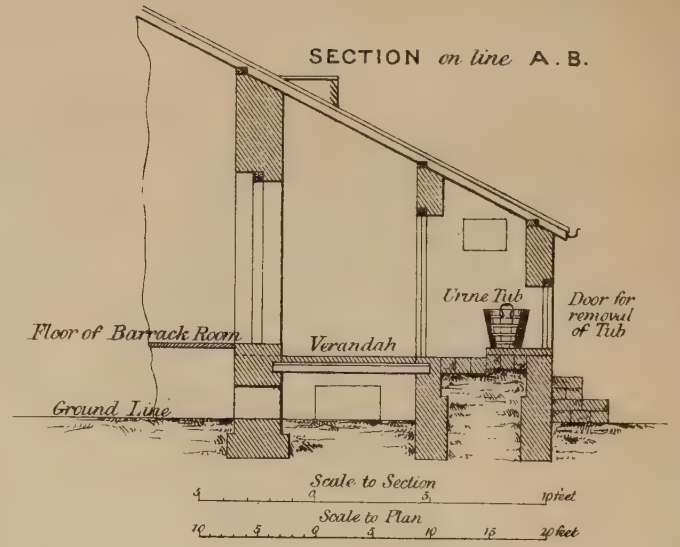
SECTION.

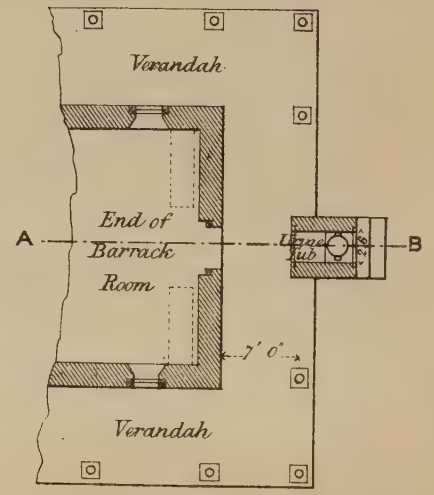



PLAN.




# URINE TUB, &c.



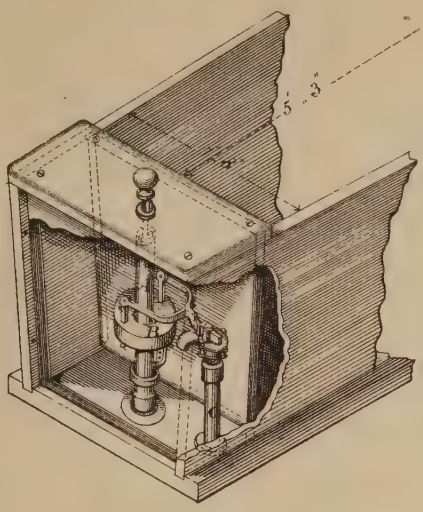

PLAN

*Shewing position of Urine Tub under Verandah*

Day & Son, lith. to the Queen

## JENNING'S SLATE BATH

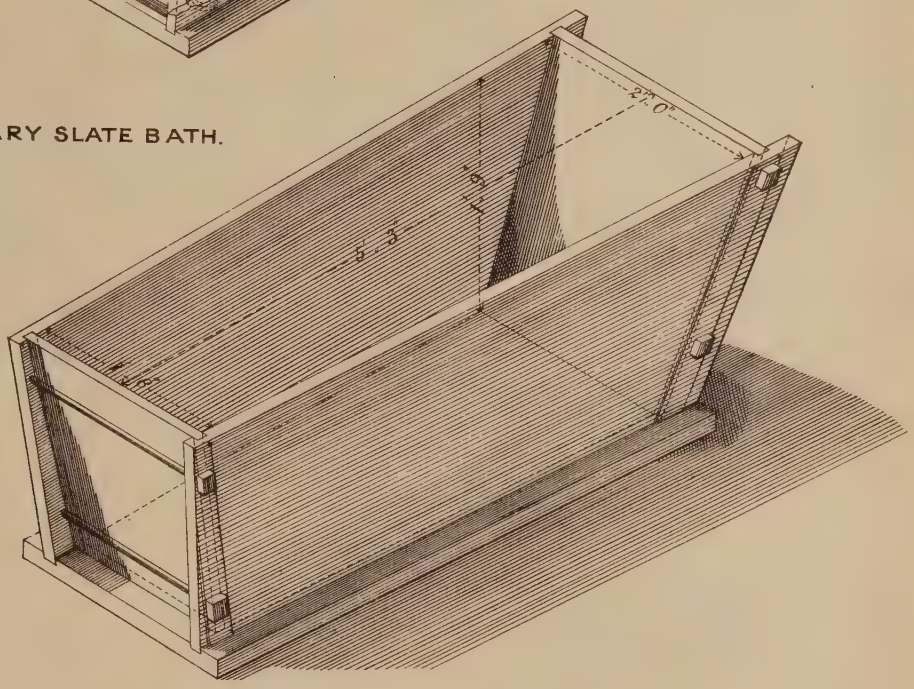
*Drawing shewing Supply and Discharge Apparatus.*



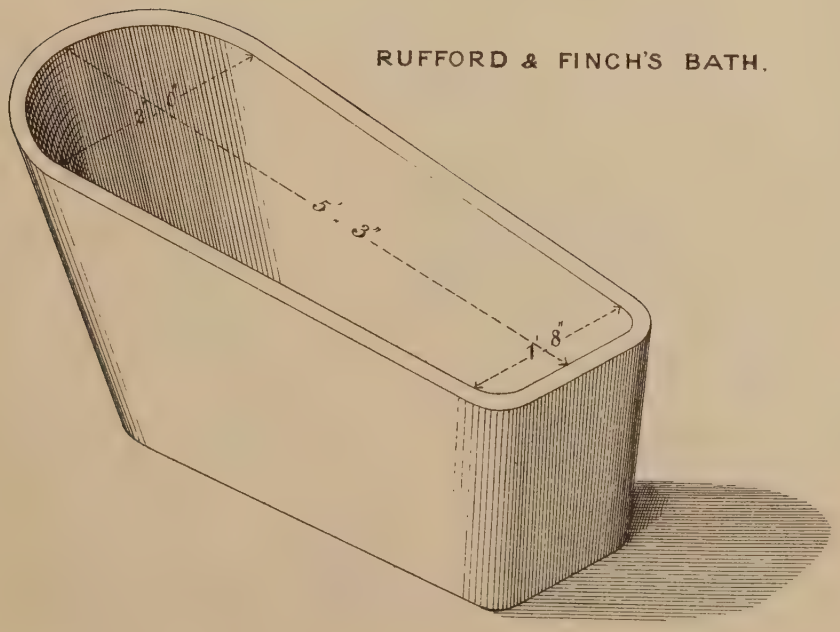

*A. Hollow Plug & Waste.*
*B. Float.*
*C Supply & Hydrostatic Valve. to prevent the Bath being filled beyond 9 inches in depth.*

*Note. This Bath is of the same internal dimensions as that figured below.*

## ORDINARY SLATE BATH.



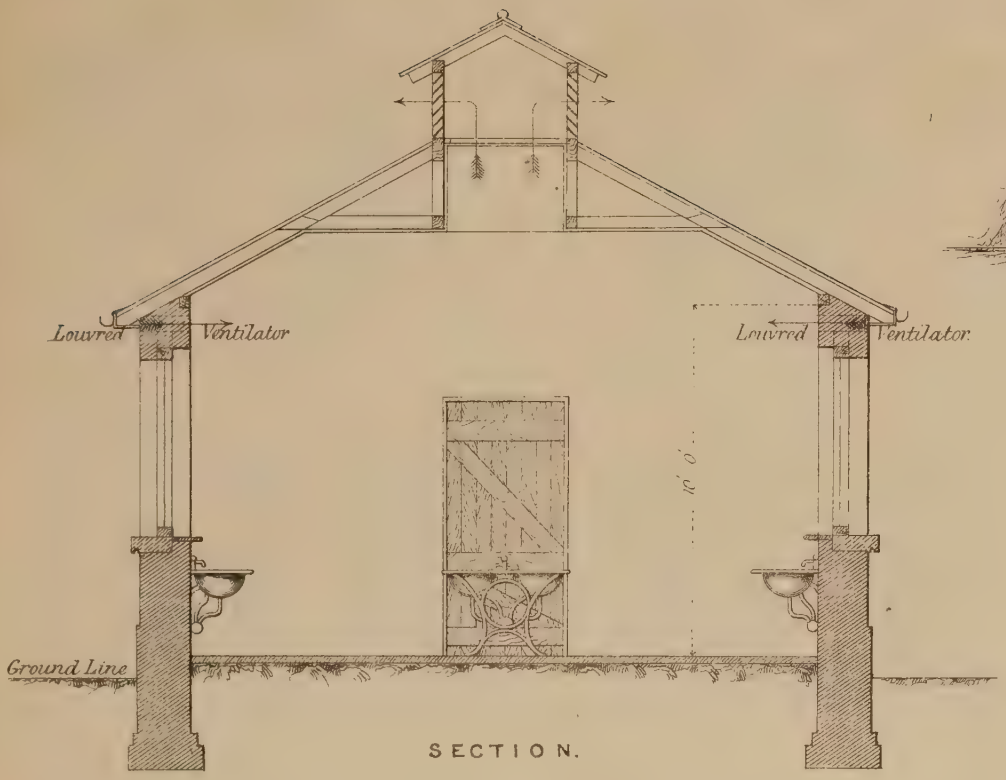

## RUFFORD & FINCH'S BATH.



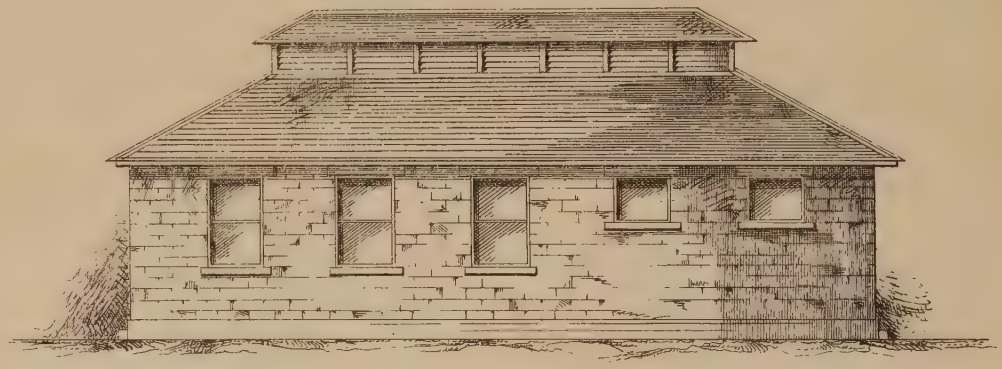

Scale of 12 6 0 1 2 3 4 feet

Day & Son, lith. to the Queen

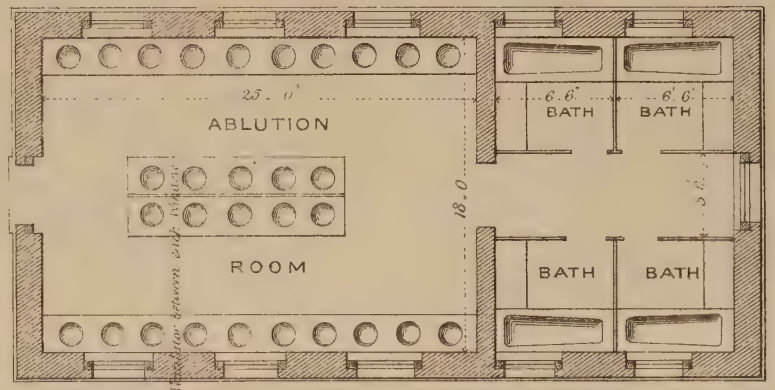
# ABLUTION ROOM & BATHS.




SECTION.



ELEVATION.




PLAN.

Scale to Section.

5 0 5 10 15 feet.

Scale to Plan & Elevation.

5 0 5 10 15 20 25 30 35 feet.

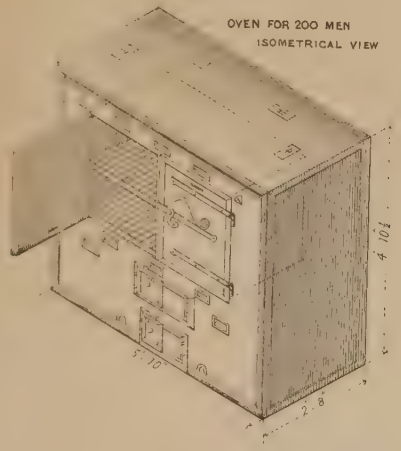
Day & Son, lith. to the Queen.

# APPROVED PATTERNS OF STEEL COOKING OVENS & BOILERS.

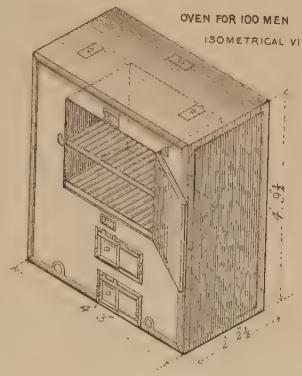
MANUFACTURED BY EDWARD DEANE, 1 ARTHUR STREET EAST, LONDON BRIDGE E.C.



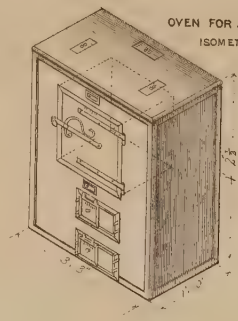
OVEN FOR 200 MEN
ISOMETRICAL VIEW



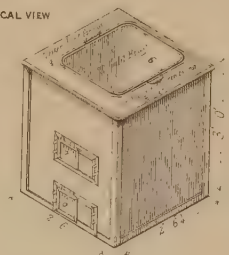
OVEN FOR 100 MEN
ISOMETRICAL VIEW



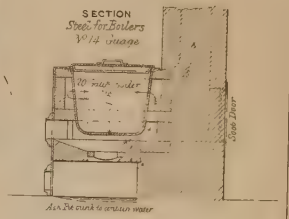
OVEN FOR 50 MEN
ISOMETRICAL VIEW



BOILER FOR 50 MEN
ISOMETRICAL VIEW



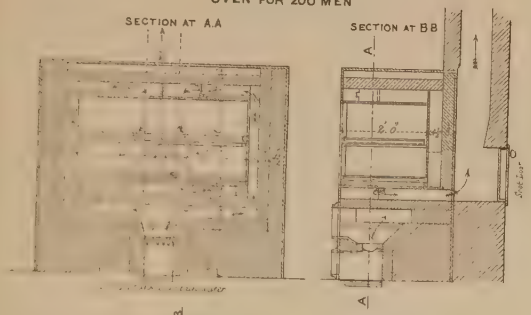
SECTION
Steel for Boilers
N°14 Guage



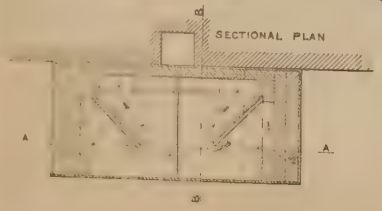
OVEN FOR 200 MEN

SECTION AT A.A

SECTION AT B.B



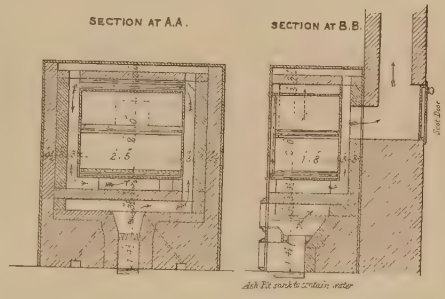
SECTIONAL PLAN



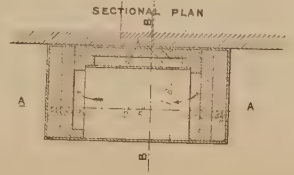
OVEN FOR 100 MEN

SECTION AT A.A.

SECTION AT B.B.



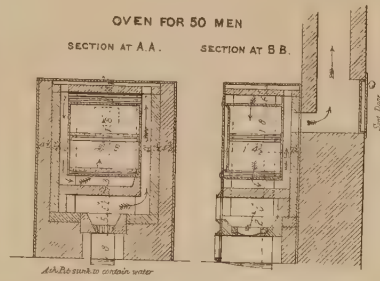
SECTIONAL PLAN



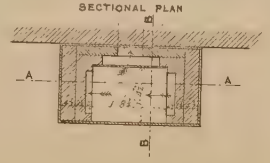
OVEN FOR 50 MEN

SECTION AT A.A.

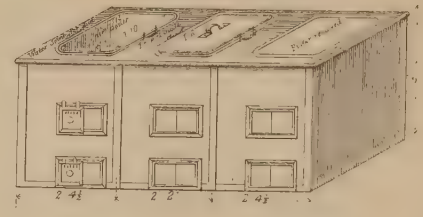
SECTION AT B.B.



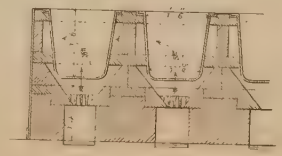
SECTIONAL PLAN



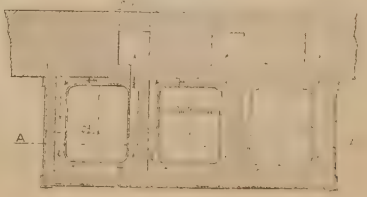
RANGE OF 3 BOILERS
FOR 50 MEN EACH
ISOMETRICAL VIEW



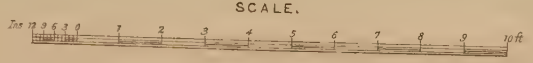
SECTION AT A A



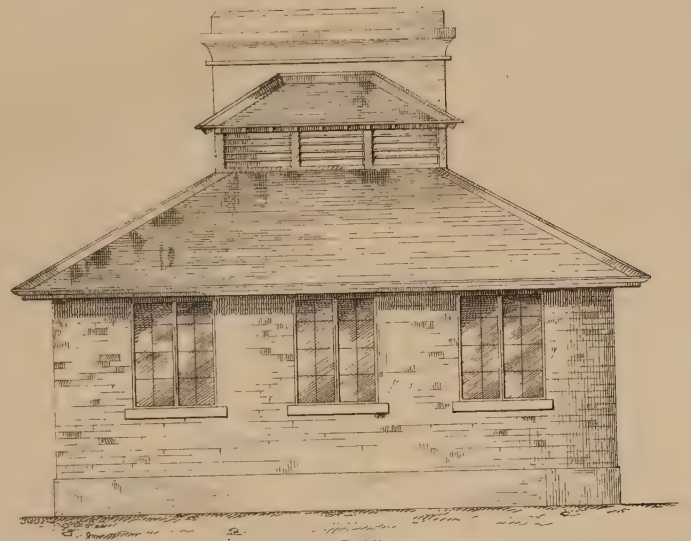
SECTIONAL PLAN



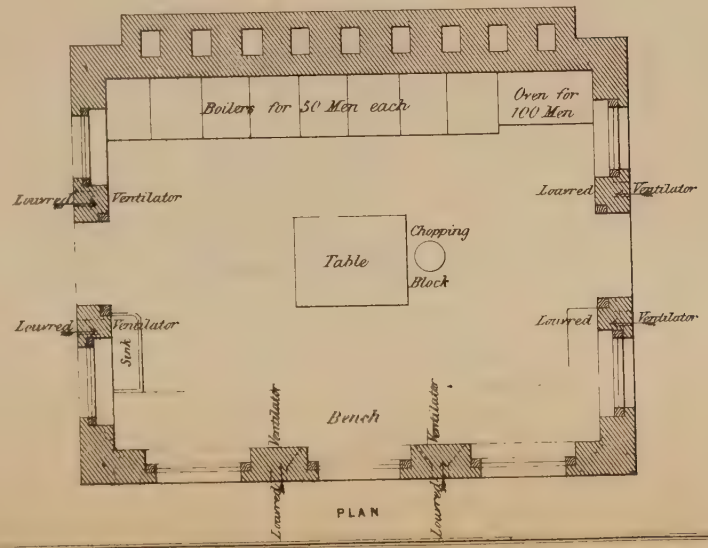
SCALE.



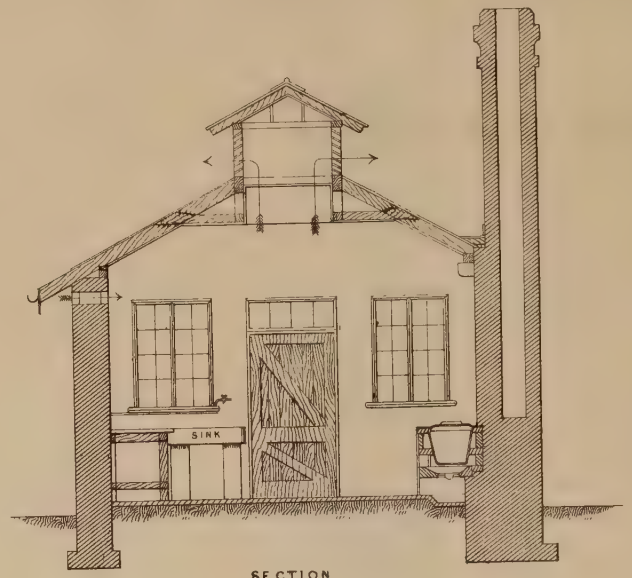
# PLAN, ELEVATION & SECTION OF COOKHOUSE.



ELEVATION



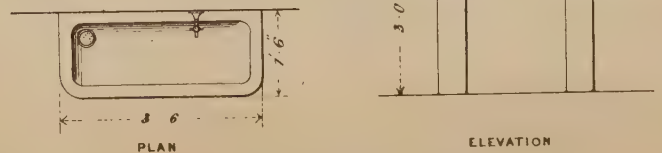

PLAN




SECTION
SHEWING METHOD OF VENTILATION

SCALE OF FEET FOR PLAN ELEVATION & SECTION

10 0 5 10 15 20




PLAN ELEVATION

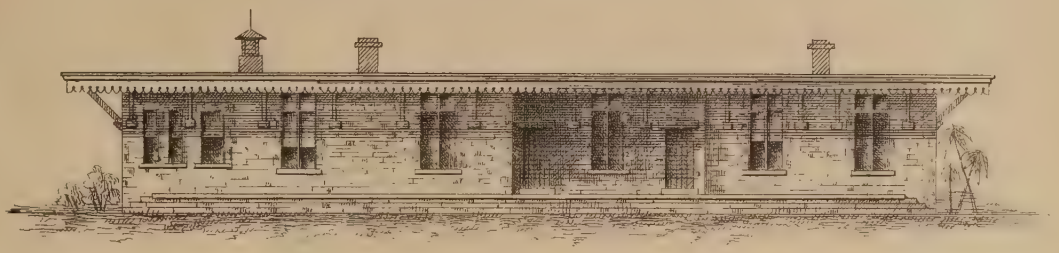
SINK AND WATER SUPPLY.
1/3 inch scale

Day & Son, Lith.rs to the Queen

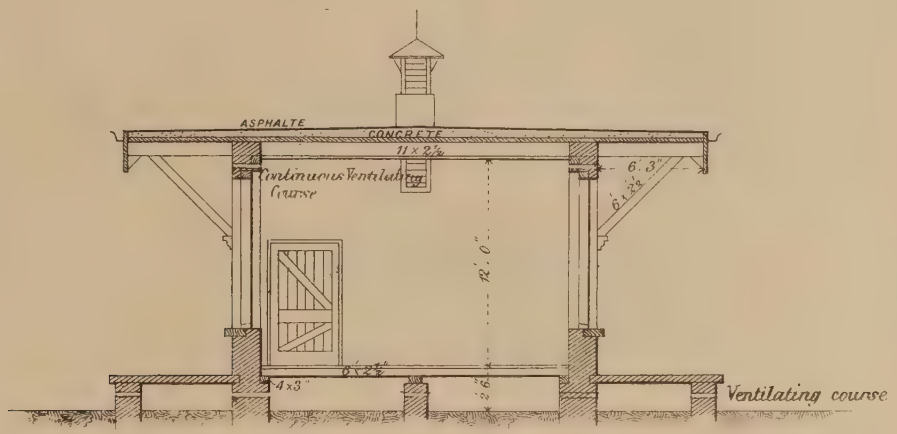
# CERIGO

## PROPOSED HOSPITAL.

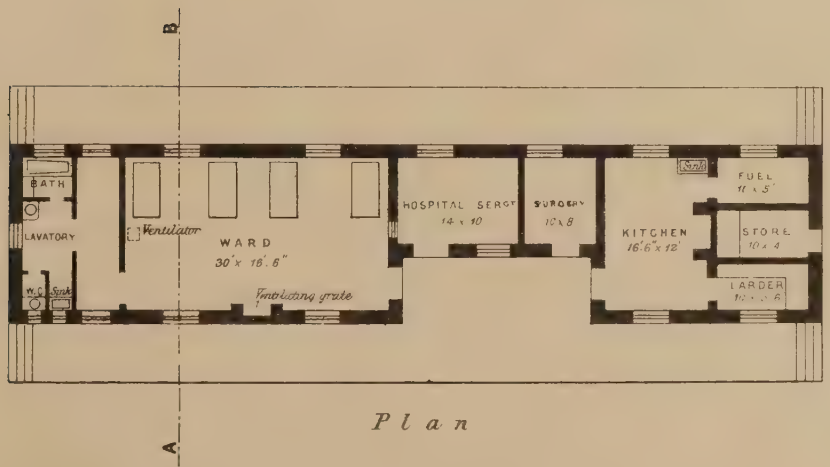
Plan XX.



*Elevation*




*Section on the line A.B.*




*Plan*

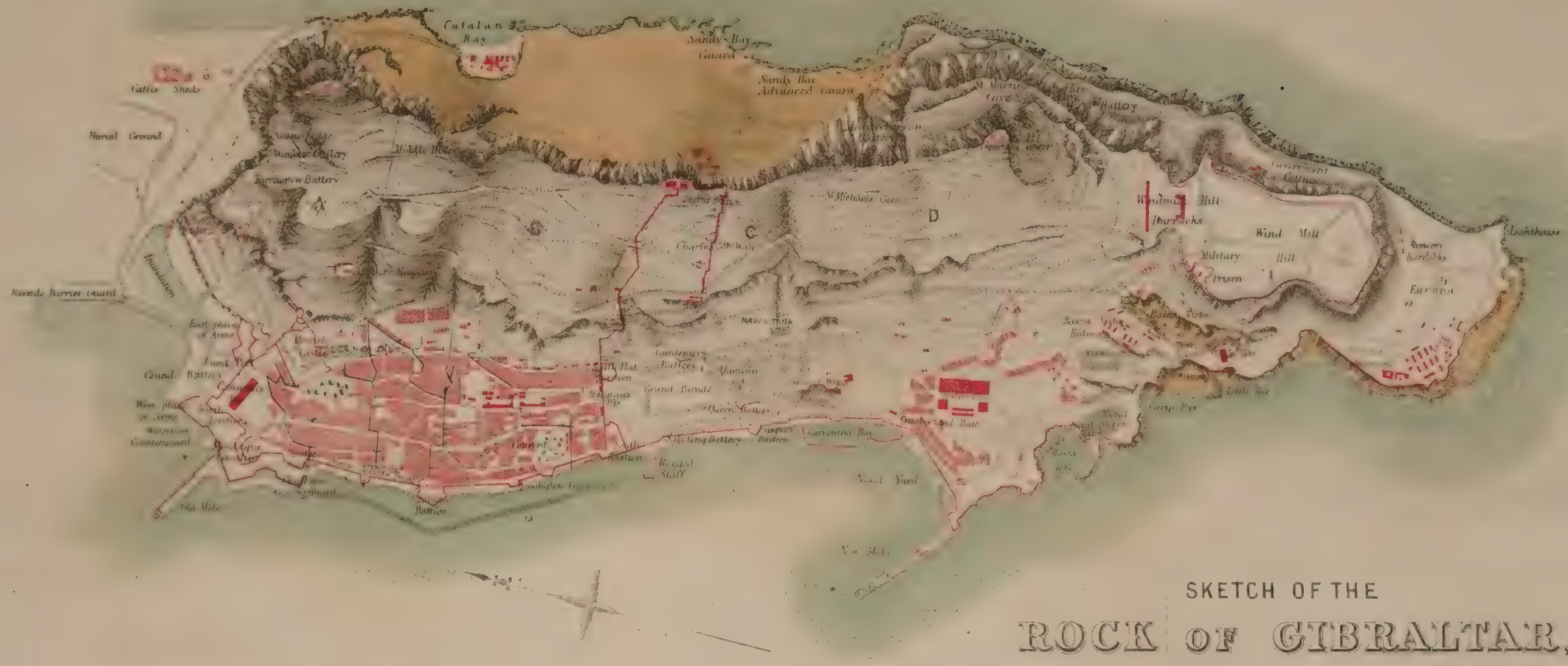
*Scale for Plan & Elevation.*

10 5 0 10 20 30 40 50 feet

*Scale for Sections*

10 5 0 10 20 feet

Day & Son Lith.rs to the Queen.




SKETCH OF THE

# ROCK OF GIBRALTAR,

## Shewing the position of the Barracks & Casemates

AND THE STREETS OF THE TOWN

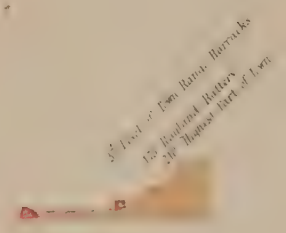
*The Water Tanks and Lines of Sewers & Drains,*

AND ALSO

The General Configuration of the Ground.

SECTION ON A B.

SECTION ON C D.



Areas of watershed whence the water supply may be obtained

A *about 40 acres to supply Tank near Moorish Castle*
B *about 60 acres to supply the proposed New Tank at Buena Vista*
C *about 30 acres to supply the Naval Tank (New)*
D *about 50 acres to supply the proposed New Tank at Buena Vista*

—— *Approximate line of pipe for conveying the water to the Tanks at Buena Vista.*

SCALE 1200 FEET TO AN INCH

1/14400

1800 900 600 300 0 600 1200 1800 2400 3000 3600 FEET

REDUCED FROM THE 1/4800 PLAN

Day & Son, Lith.rs to the Queen

# GIBRALTAR

## PLAN SHEWING THE EXISTING SYSTEM OF
## DRAINS
## IN THE CITY.

*N.B The Main Sewers are tinted Blue. the letters refer to the Sections of Main Sewers in Plan 2.*

Scale 200 feet to an Inch.

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 FEET

J. L. Watson Lt
25th Regt R.E.

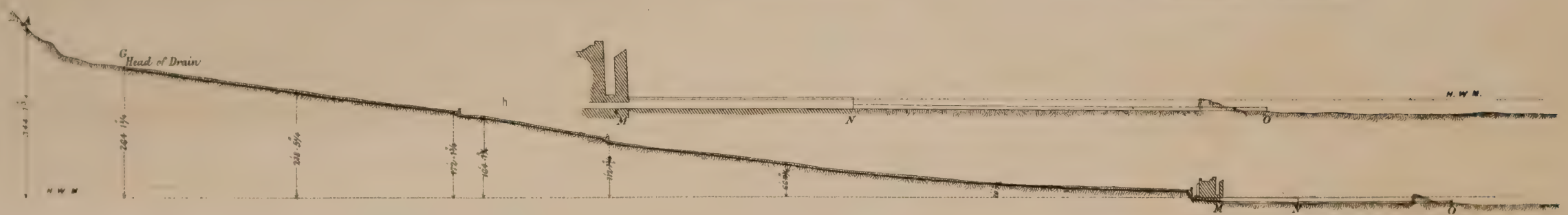
Wm. T. Stickelson
Colonel Comdg R.E.
8th Jan 1862.

Day & Son Lith. to the Queen

# GIBRALTAR

## SECTIONS OF MAIN SEWERS RELATING TO PLAN XXII.

*N. B. The Heights all refer to High Water Mark, which is considered to be 1 foot below the plinth of the Line Wall.*



J. L. Watson Lt
25th Regt RQMs

Byt. Lt. Nicholson
Wtrvlt, R. Es
8th Decr 1862

Day & Son, Lith.rs to the Queen

# GIBRALTAR.

Plan shewing the
PROPOSED SYSTEM OF DRAINAGE IN THE CITY,
also the
PROPOSED MEANS OF FLUSHING THE SEWERS.

Proposed Pipe for conveying Water to heads of Drains for Flushing
Proposed Tank
Privy
Privy
Proposed intercepting Sewer
Pipe to drain portion of Town coloured Brown
6" Pipe to drain the Barracks
Pipe to drain portion of Town coloured Yellow
6" Pipe to drain Barracks
6" Pipe to drain Barracks
Engine House
Water in Tank
Pipe for supply
Scale of 400 Feet to One Inch.

The figures in blue at the heads of the Sewers shew their height above high water mark.

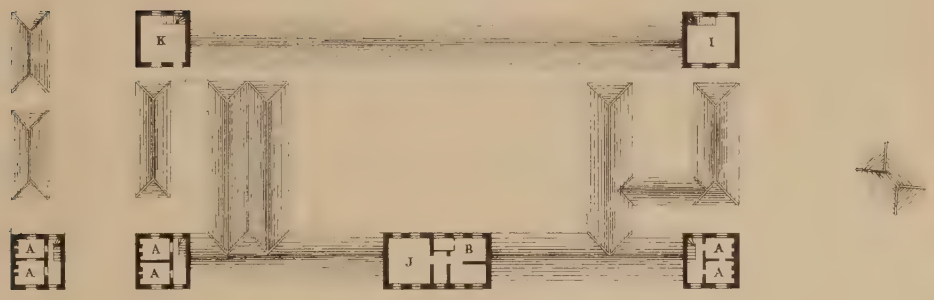
J. L. Watson Lt
25th Regt R.E.

Benj. J. Stickelen
Colonel CRE
8th Jan 1862.

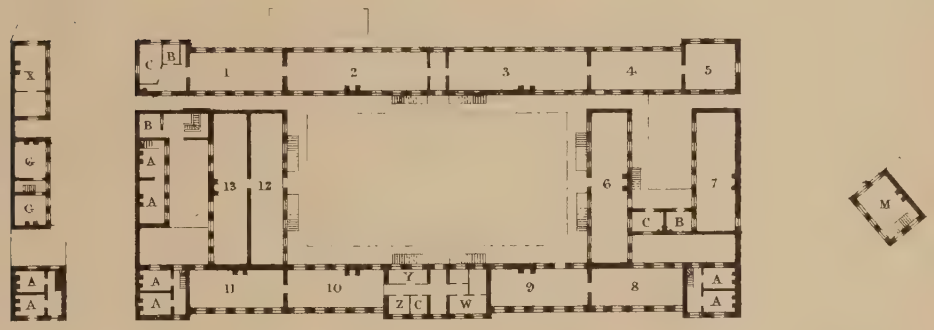
# GIBRALTAR.

## NAVAL HOSPITAL.

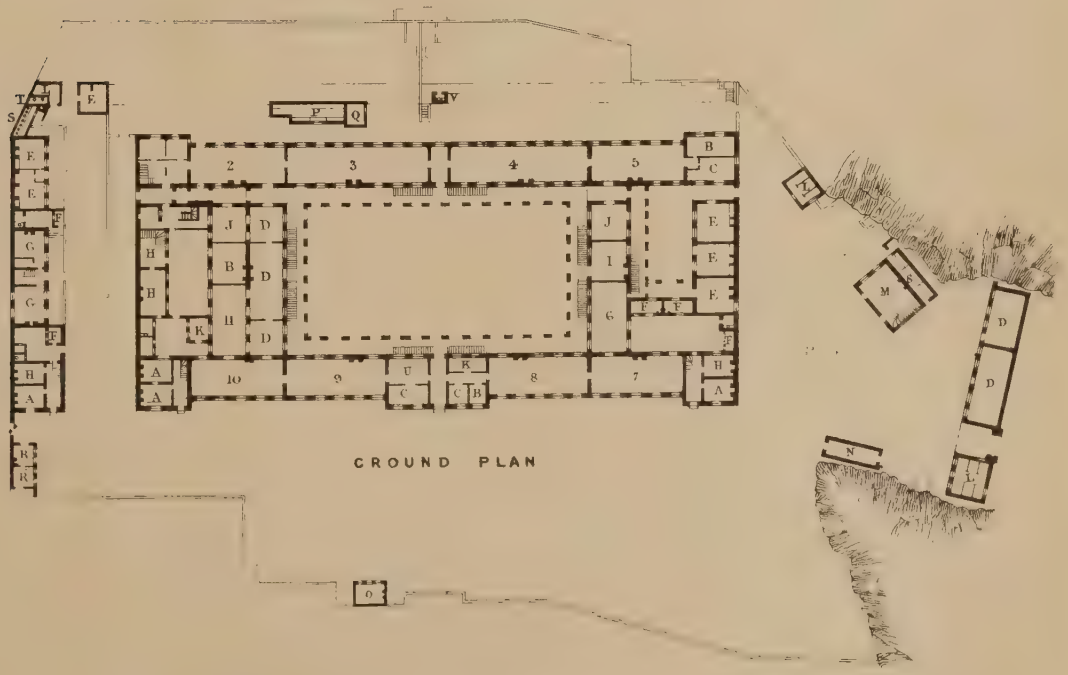
As at present existing




SECOND FLOOR PLAN.

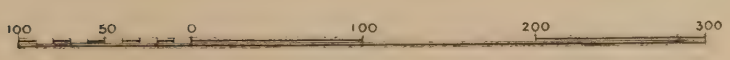



FIRST FLOOR PLAN




GROUND PLAN

SCALE OF FEET

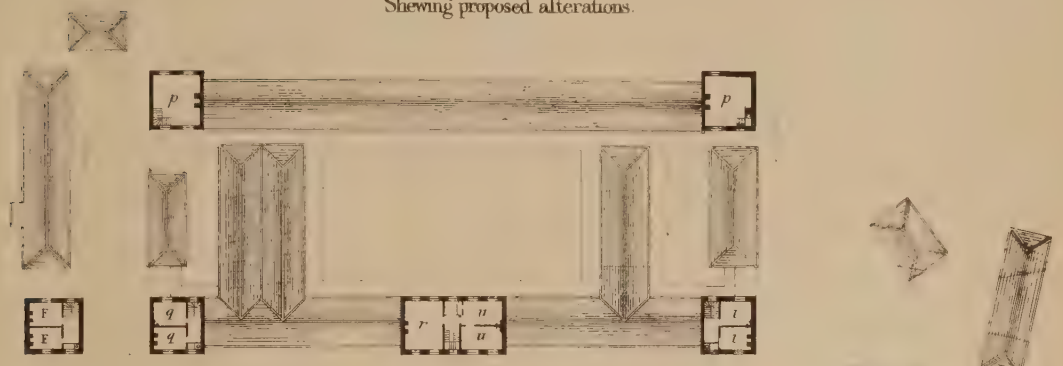



Day & Son, Lith^rs to the Queen

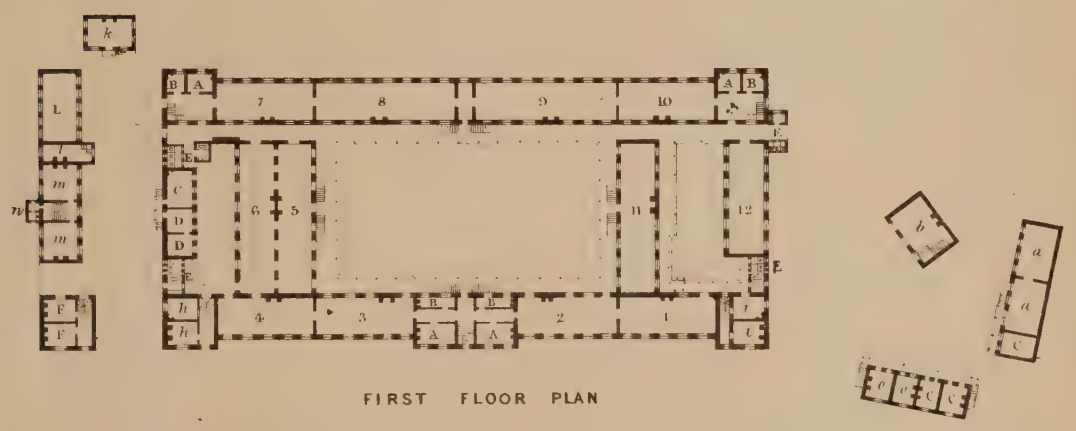
# GIBRALTAR.

## NAVAL HOSPITAL.

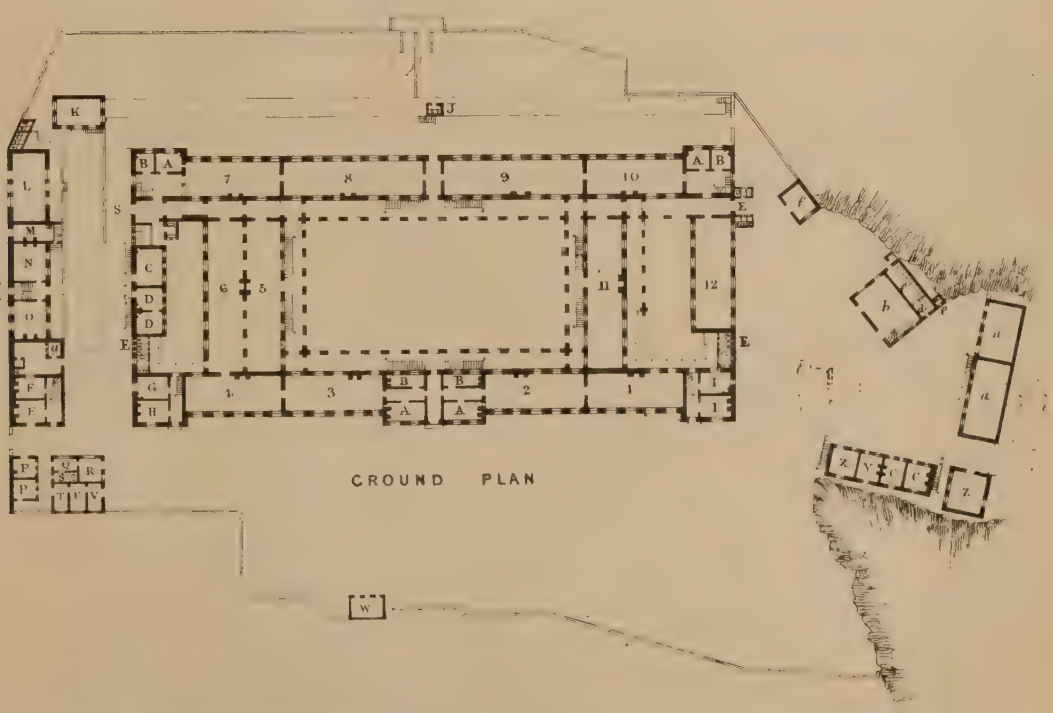
Shewing proposed alterations.



SECOND FLOOR PLAN



FIRST FLOOR PLAN



GROUND PLAN

SCALE OF FEET

100 50 0 100 200 300

L.T.

Day & Son, Lith.rs to the Queen

# VALETTA

*In the Island of Malta*

SHEWING THE CONFIGURATION OF THE GROUND, THE GENERAL CONSTRUCTION OF THE TOWNS THE POSITION OF THE

## BARRACKS AND HOSPITALS

AND THE LINES OF

## PUBLIC SEWERS

SCALE

500 1000 English Yards

St JULIANS BATTERY

POINT DRAGUT

Fort Tigne

LAZZARETTO

Quarantine Ground

MARSA MUSCETT

MISIDA

Lower St Elmo Barracks

Upper St Elmo Barracks

General Hospital

St James Cavalier

St Peters Lower Counterguard

St Salvadore Counterguard

Floriana Barracks

BARCELONETTA

The Parade

THE PUBLIC GARDEN

VALETTA

GREAT PORT

PIETA

Fort St Angelo

FORT RICASOLI BARRACKS

Rinella Creek

NOTE.—*The different Barracks are shewn* ▨
*The Public Sewers are coloured* ..... *Blue*

Dav. & Son Lith.rs to the Queen

CORALINO

St Francisco di Paolo
Barracks

Timber Lake

Ferry

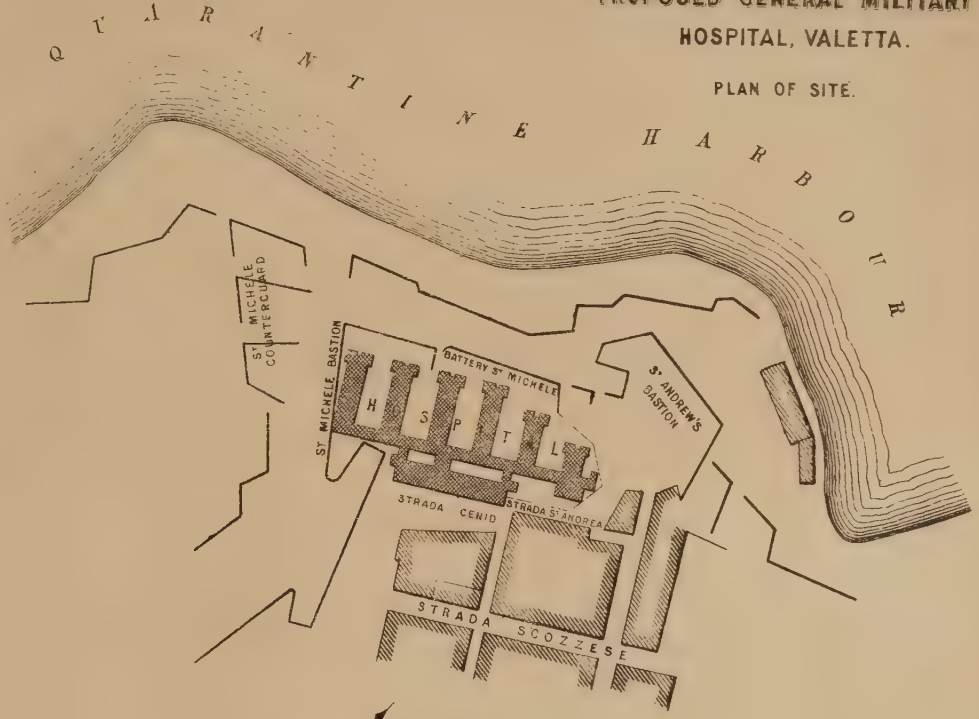
Ferry

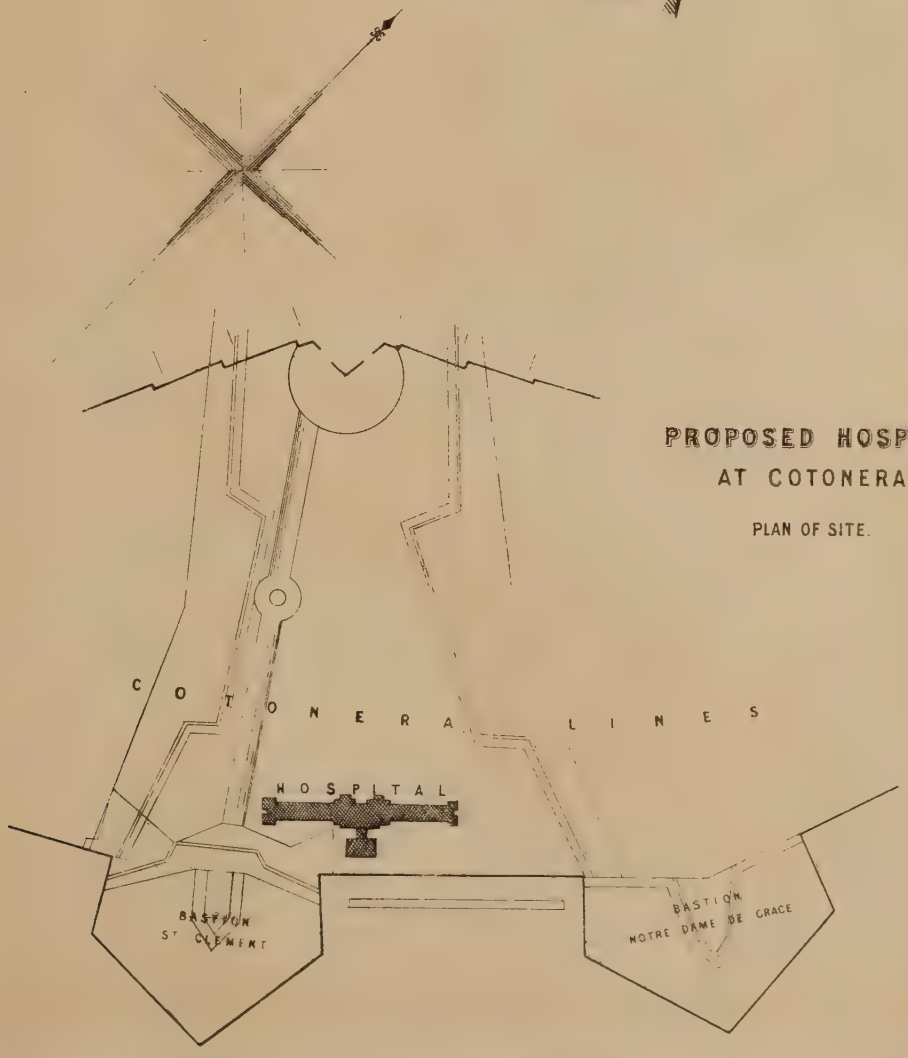
Ferry

# MALTA.

## PROPOSED GENERAL MILITARY HOSPITAL, VALETTA.

PLAN OF SITE.

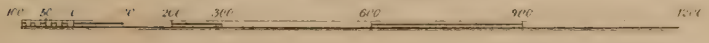


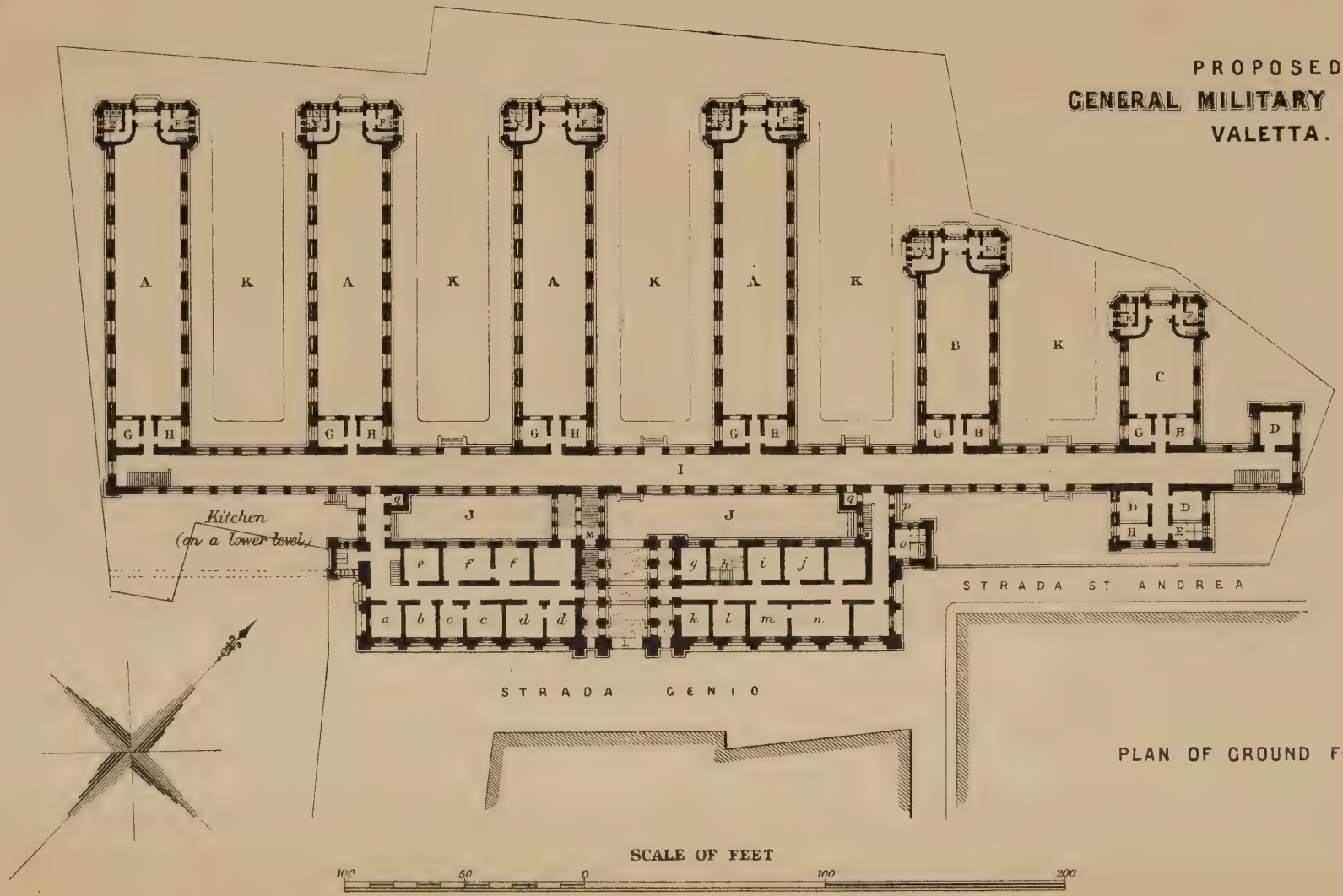

## PROPOSED HOSPITAL AT COTONERA.

PLAN OF SITE.

SCALE OF FEET.



# PROPOSED
# GENERAL MILITARY HOSPITAL.
# VALETTA.




PLAN OF GROUND FLOOR.

SCALE OF FEET

100 50 0 100 200

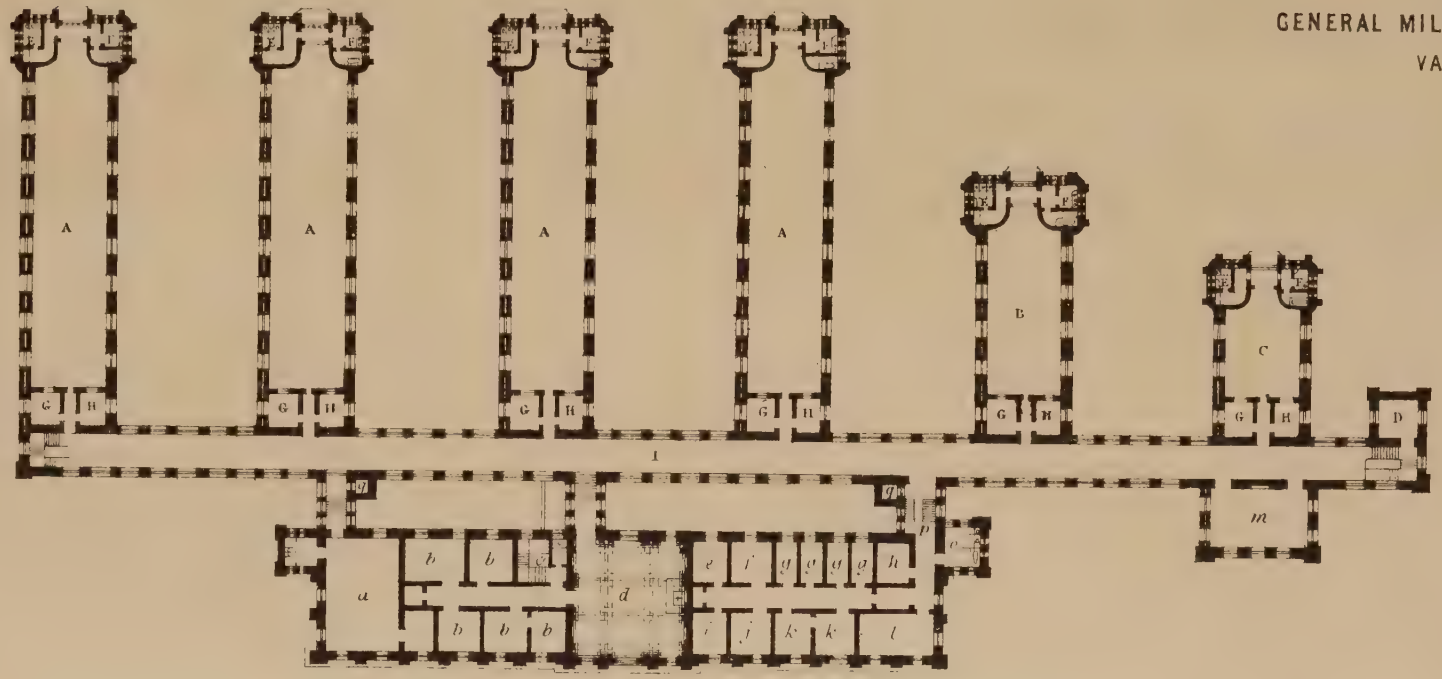
PLAN XXIX.

Day & Son Lith.rs to the Queen

PROPOSED

GENERAL MILITARY HOSPITAL.

VALETTA.




PLAN OF UPPER FLOOR

SCALE OF FEET.

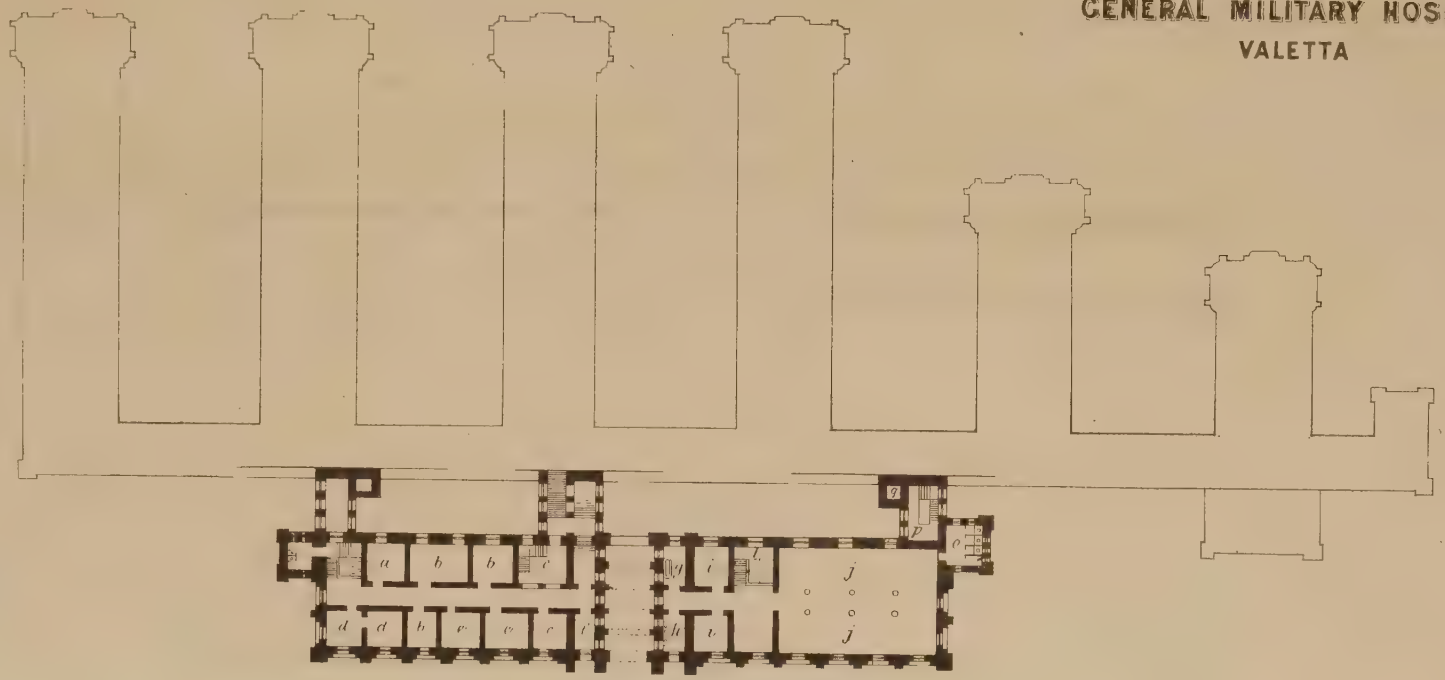
100 50 0 100 200

PLAN XXX.

PROPOSED

GENERAL MILITARY HOSPITAL.

VALETTA



PLAN OF MEZZANINE.

SCALE OF FEET.

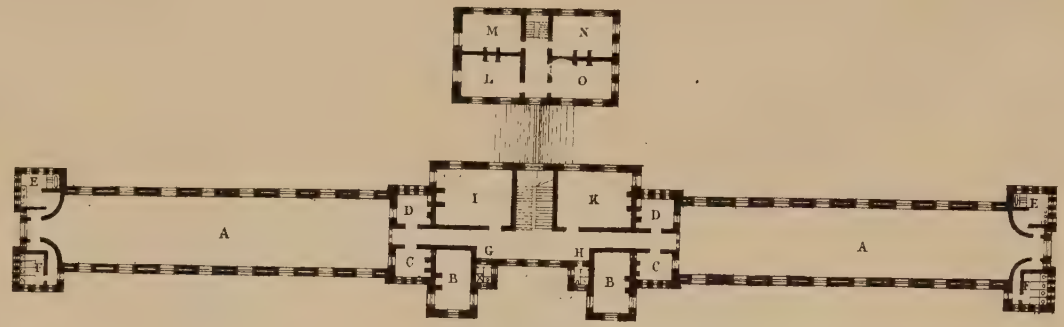
100 50 0 100 200

PLAN XXXI.

Dedicated by Command to the Queen

PROPOSED

# HOSPITAL AT COTONERA.




FIRST FLOOR PLAN.

GROUND PLAN.

SCALE OF FEET

100 50 0 100 200

PLAN XXXII.

Day & Son Lithrs to the Queen

Calafationes

Schiopastres

Gasturi

Viro

Fountain of Arethusa

Peramo

Canal Lauricenus

Alipu

Pondicomsi

LAKE OF CALIKIOPULO

PENINSULA OF CHRYSOPOLIS

Casopitra

Monte Separato 168

St Elias 118

Mamalus 176

Monte Olivetto 106

Ascention

Castrades

San Salvador

San Paul Rogue

St Roque

Fort Abram

Fort Neuf

Castrades Bay

TOWN OF CORFU

St Nicolo

Citadel

Afra

Evropulis

Viaro

Potamo

Condocoli

Govino

Govino Harbour

Lazaretto

Fustaphiona

Manduchio

Caloyero

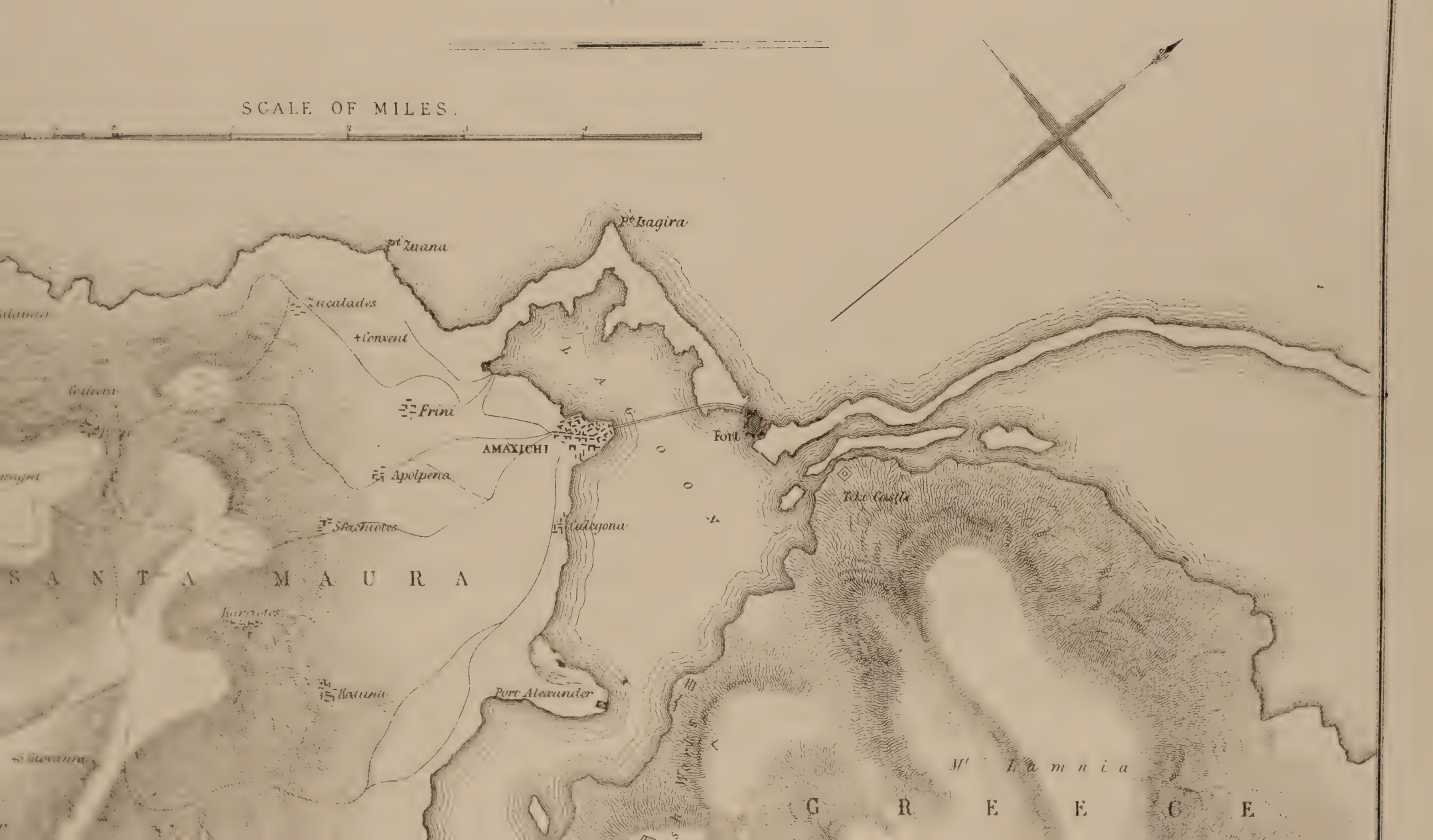
Island of Vido

Lunet Wellington

Fort George

TOPOGRAPHICAL SKETCH
OF THE COUNTRY IN THE
NEIGHBOURHOOD OF THE GARRISON
CORFU.

Scale of 2 Inches to a Mile


SCALE OF MILES.
Pt Isagira
Pt Zuana
Zucalades
+Convent
Frini
AMAXICHI
Fort
Apolpena
Tekr Castle
Sfactiotes
Ludegona
SANTA MAURA
Katuna
Port Alexander
Mt Kamnia
GREECE

PLAN XXXV.

# SKETCH MAP
of the Country round the
# BARRACKS & HOSPITAL
# CEPHALONIA.

Day & Son lith.ers to the Queen